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Management Digest®

NOVEMBER 1957

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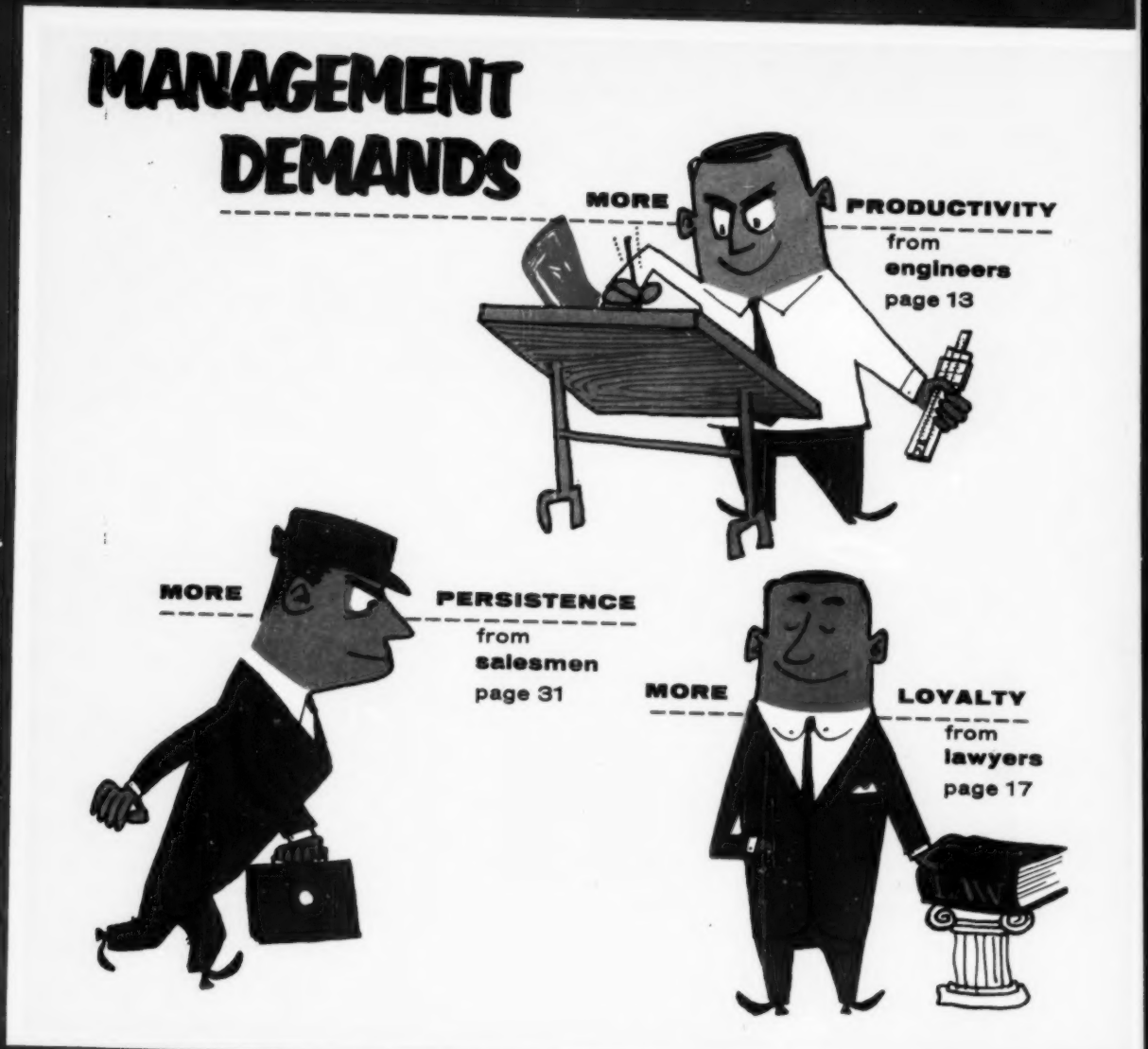
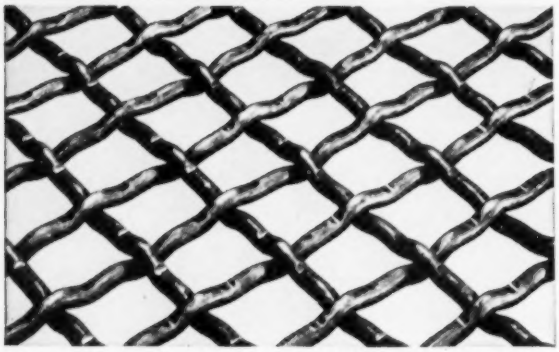


Hewitt-Robins' complete line of bulk materials handling and processing equipment can help solve your problem, large or small.

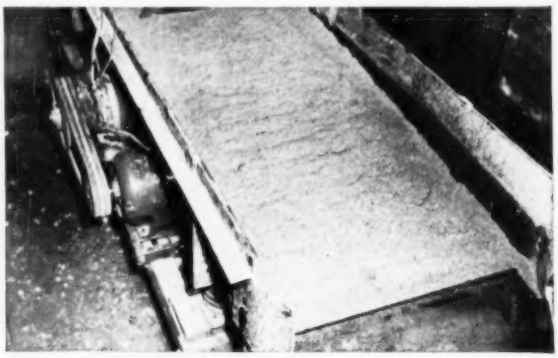
Hose. Hewitt-Robins manufactures over 1,000 types of industrial hose . . . each designed to fill a specific hose application. Hewitt-Robins hose has proved its superiority on the job. In case after case, actual performance records prove that Hewitt-Robins hose is safer, performs longer, provides greater economy.



Screen Cloth. Hewitt-Robins screen cloth is specially engineered to accurately size large tonnages and cut screening costs . . . utilizing a full range of metallic wire to meet individual job requirements . . . available in standard production size openings from 3/16" and coarser; wire sizes from .105" up to and including 1" diameter.

Belt Conveyors. Hewitt-Robins designs and manufactures a complete line of belt conveyor systems engineered to meet the specific requirements of particular jobs . . . Belting, conveyor machinery and component parts are readily available from standard "on-the-shelf" stock, and are guaranteed to provide top conveyor performance.

Vibrating Screens. Hewitt-Robins manufactures four types of economical vibrating screens . . . Gyrex® positive stroke 4-bearing screens; Eliptex® horizontal operating flat screens; Vibrex® full-floating, unbalanced pulley-type 2-bearing screens and the Eliptex Dewaterizer having specially designed Eliptex screen with micron-size opening stainless steel flat rod deck.



Vibrating Feeders and Conveyors. Fully mechanical, high capacity—low power consumption vibrating feeders easily maintained by your own personnel. Continuously balanced vibrating conveyors now available in longer units with higher capacities at lower horsepower. Handle a wide range of materials—wet or dry, lump or pulverized, packaged or loose, hot or cold, abrasive or corrosive.

HEWITT-ROBINS

INTERNATIONAL DIVISION

STAMFORD, CONNECTICUT, U.S.A.

CANADA, Montreal, P. Q., Hewitt-Robins (Canada) Ltd., 2052 St. Catherine St., W.
ENGLAND, London W 1, Hewitt-Robins (Great Britain) Ltd., 8 Cavendish Place
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SOUTH AFRICA, Johannesburg, Robins Conveyors (S.A.) Ltd., P.O. Box 4736
EXPORT DEPARTMENT, New York 17, N. Y., Hewitt-Robins, 370 Lexington Ave.

Model HD-16

150 net engine hp
WEIGHT: 26,200 kg (57,800 lb) tractor and side boom with full counterweight
35,150 (77,500 lb) lifting capacity at 4-ft overhang

Two HD-16's team up to move big sections of pipe over rough terrain.

Cradling heavy, bulky pipe ahead of coating-wrapping machine, or lowering it on steep hillsides or in mucky swamplands requires precise maneuvering. Sensitive controls permit operator to handle this difficult work with a minimum of effort.

Allis-Chalmers Tractors with Side Booms Speed Pipe-Line Construction

The Model HD-16 tractor, equipped with side boom, enables contractors to lay pipe lines faster and at lower cost than ever before, and provides great lifting capacity, stability and safety for this difficult work . . . across mountains, forests, swamps, deserts, rivers, and in all kinds of weather.

This powerful unit cradles and lowers pipe of all dimensions into the trench, and is used for maintenance and repair work on existing pipe lines. Also employed in conjunction with other machines for cleaning, priming, coating, and wrapping the pipe, and for bending and welding it.

POWERFUL ALLIS-CHALMERS DIESEL ENGINE offers quick starting and long-life performance. High power output with big reserve capacity means low maintenance costs.

HYDRAULIC TORQUE CONVERTER DRIVE provides smooth, cushioned power for tractor and boom, eliminates most shifting so operator can concentrate on pipe work. The HD-16 matches its speed perfectly to slow-moving cleaning, priming, wrapping machines, even on steep grades.

EASY TO OPERATE AND SERVICE. Direct electric starting on diesel fuel; hydraulic, finger-tip steering; self-energizing brakes and comfortable foam rubber seats. These, and such other outstanding features as fewer lubrication points and 1,000-hour lubrication intervals for truck wheels, idlers and support rollers, result in low maintenance costs and more work accomplished.

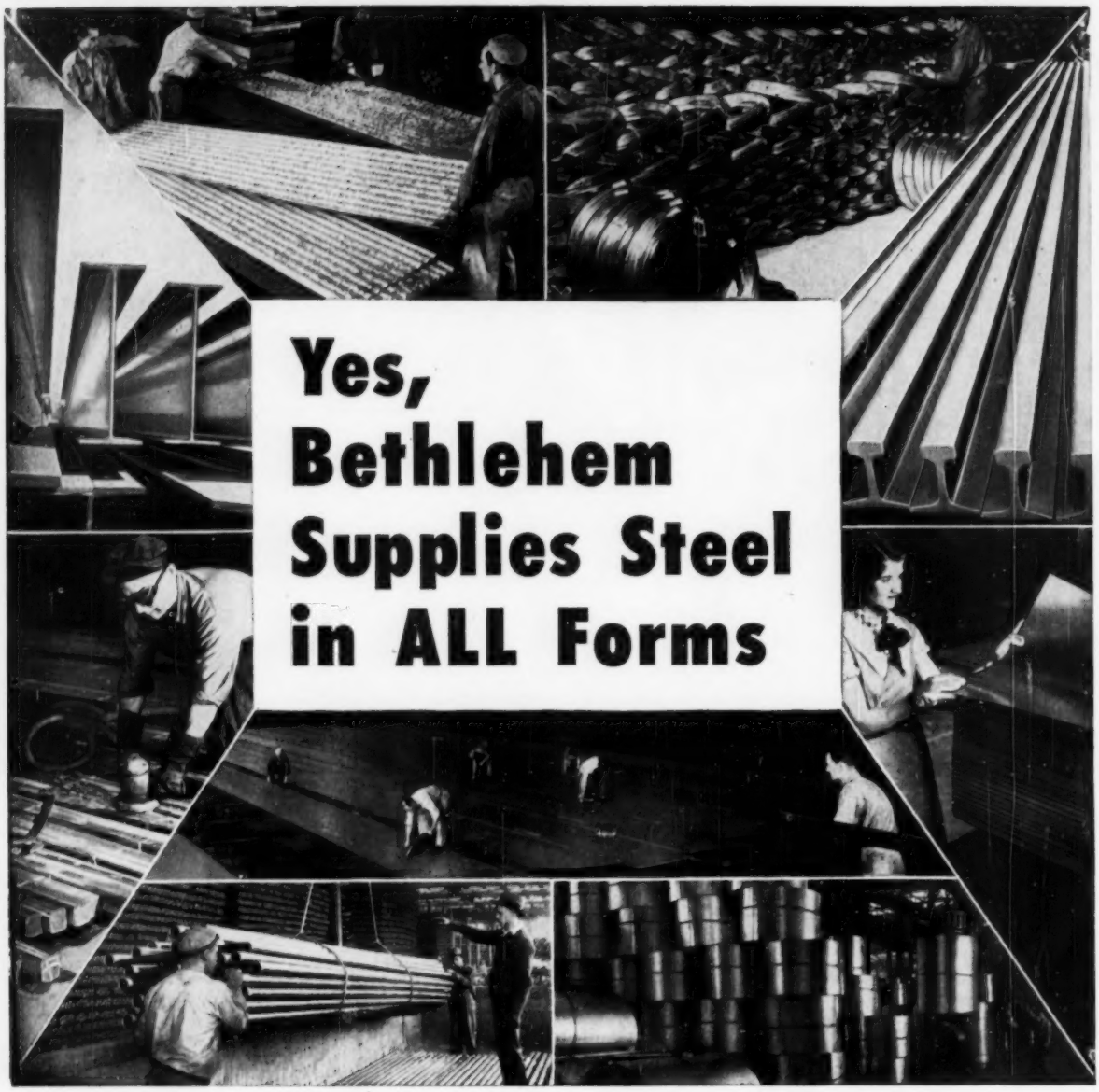
SAFE, HEAVY-DUTY SIDE BOOM is equipped with drop-proof heavy counterweights. Internal expanding brakes are fully enclosed from dirt and moisture. Controls are easy-working, convenient.

For complete information about this and other Allis-Chalmers pipe-laying models, consult the Allis-Chalmers construction machinery dealer in your area.

ALLIS-CHALMERS, EXPORT DEPARTMENT MD1157, TRACTOR DIVISION, MILWAUKEE 1, U. S. A.

BUILDERS OF MACHINERY SINCE 1847

ALLIS-CHALMERS



Yes, Bethlehem Supplies Steel in ALL Forms

Bethlehem doesn't limit its production of steel to a few general items. It is a world supplier of steel in all standard forms, including bars, alloy steels, tool steels, plates, structural shapes, sheets, strip, tin plate, wire products, rods, pipe, rails.

Bethlehem is a completely integrated steelmaking organization. We have our own ore mines, furnaces, treating ovens, rolling mills, laboratories, and all other equipment needed in the making of steel. Centralized control enables us to fill your wants more promptly and to furnish you with a wide variety of steel products in virtually every form.

No matter where you are, you're always close to a Bethlehem office or representative. It is the job of our offices and representatives everywhere to keep you supplied with the products we make, and to give you friendly service at all times. Bethlehem Steel Export Corporation, 25 Broadway, New York 4, U.S.A. Cables: "BETHLEHEM, NEWYORK."

Bethlehem's great Sparrows Point plant in the Port of Baltimore, U.S.A., is the world's largest steel mill located on tidewater. Products for export can be loaded from this plant directly aboard ship.

BETHLEHEM STEEL

Represented in all principal cities of the world by offices and representatives of Bethlehem Steel Export Company.

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McGRAW-HILL INTERNATIONAL

NOVEMBER 1957
VOL. 12 NO. 11

Management Digest.

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NEW YORK CITY
NOVEMBER 1957

The Readers Report . . .

Maui Was First

Sir . . . Referring to your August 1957 issue, may I point out that installation of 33-ton tetrapods was made several years ago in the Kahului Harbor breakwater on the Island of Maui, Hawaii.

As Hawaii is part of the U.S.A. through a treaty of annexation in 1898, I am afraid that Crescent City, California, cannot make the claim—as your article suggested—for first use of the blocks in the U. S. A.

HENRY B. CLARK, JR.
CASTLE & COOKE, LTD.
HONOLULU, HAWAII

Philatelists Respond

Sir . . . As a keen reader of your magazine, and also a very keen stamp collector (I am Hon. Secretary of the Buenos Aires Philatelic Society), I was very interested in an article on this hobby published in the August issue of MANAGEMENT DIGEST under the title"You."

I was amazed however to read the following: "Just PASTE the stamps over their pictures." This is the very last thing any collector would do, beginner or not. Any stamp pasted down literally loses its value, as it cannot be identified by its water mark, type of paper, whilst any "thin" spots or damage to the back would be hidden, and "mint" copies would be ruined as the original gum would be destroyed.

The only way to affix a stamp in an album is by using a special hinge which allows for its inspection, or even removal without damage.

Other statements made by the author would indicate that he does know something about philately, which makes his observation regarding "pasting" down a stamp all the more extraordinary.

FREDERICK THOMPSON
BUENOS AIRES, ARGENTINA

Sir . . . In your August issue under "You," one reads: . . . "The most widely used general catalogs are Zumstein's from Germany . . ."

The Zumstein Catalog is the No. 1 catalog issued in Switzerland by Hertsch & Co., Market Street 50, Berne, and its prices govern the international postage stamp market. Otherwise, your article is very interesting and should promote stamp collecting among businessmen.

PABLO LEUZE B.
MEXICO D. F., MEXICO

● Our philately editor used the word "paste" loosely; he too is aghast at the thought of a mint specimen permanently stuck down with glue. As for the eminent Swiss catalog, a non-philatelic printer apparently substituted "Zumstein's from Germany" for "Zumstein's in German."—EDITOR

Opportunity in Jamaica

Sir . . . The July issue of MANAGEMENT DIGEST contained a story, "More Business for the "Tax Havens," mentioning about a dozen countries but omitting Jamaica, B.W.I.

I thought you might be interested in knowing that the Government of Jamaica two years ago adopted extensive incentive legislation including the Industrial Incentive Law, the Export Industries Law, and the International Business Companies Law.

It is the International Business Companies Law, which could be compared to those cited in your article. The principal object of this law is to attract to Jamaica management of foreign-owned companies which are engaged in business outside the Caribbean area. In this regard it is generally regarded that Jamaica is very conveniently located, has a stable and progressive form of Government, and that the necessary labor force is readily available.

The Industrial Development Corporation is the specific agency of Government through which interested parties may obtain further information on any applicable legislation.

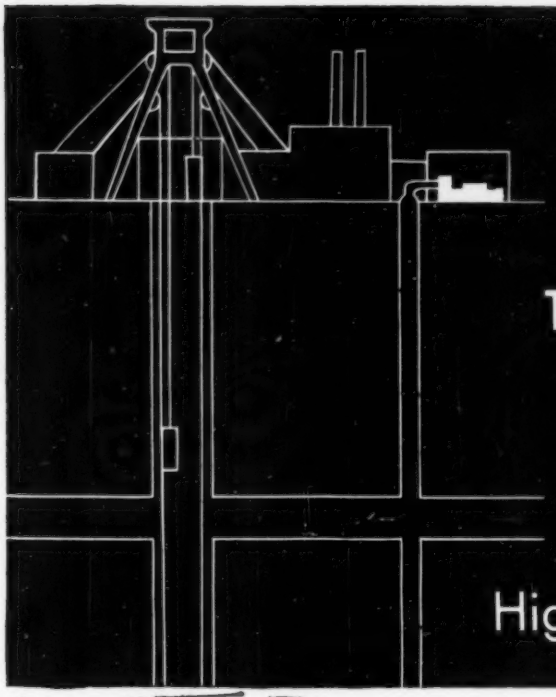
CARROLL C. DA COSTA
JAMAICA INDUSTRIAL
DEVELOPMENT CORP.
KINGSTON, JAMAICA

Congratulations

Sir . . . It was with considerable interest that we read "Changing the Map of Europe" in MANAGEMENT DIGEST of September.

We have a feeling that many leading business executives are not sufficiently aware of the change occurring every day on the Continent. Therefore we wish to congratulate you on this splendid article.

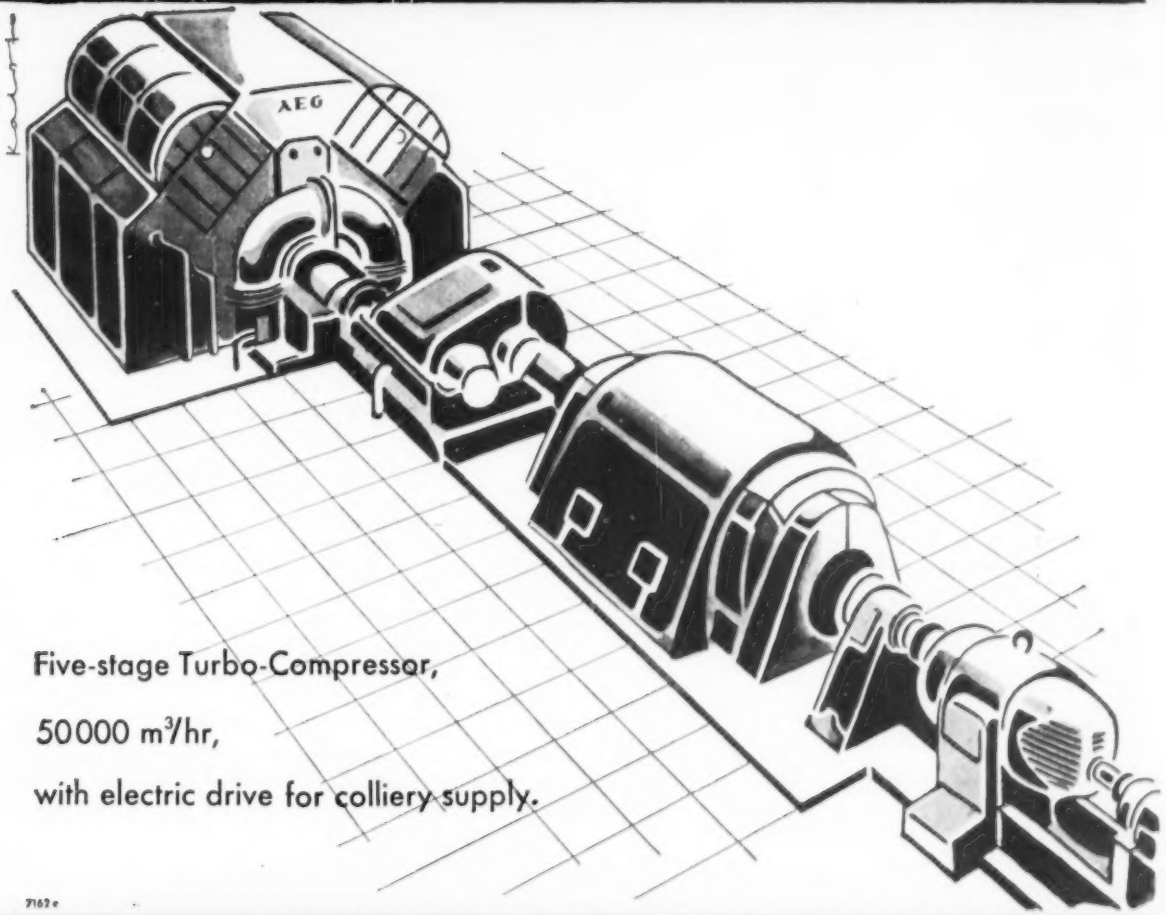
LEO SPRUYT, Manager
SPRUYT & CO.
ANTWERP, BELGIUM



AEG

Turbo-Compressors in Mining

High Isothermal Efficiency



Five-stage Turbo-Compressor,

50000 m³/hr,

with electric drive for colliery supply.

7162 e

ALLGEMEINE ELEKTRICITÄTS-GESELLSCHAFT

Berlin (West) EXPORT DEPARTMENT Frankfurt (Main)

What happened to the price of oxygen?

The price of bulk oxygen has dropped about 80% in 12 years, while most other prices have risen. Oxygen is now being produced in large quantities for a few pennies per 100 cubic feet.

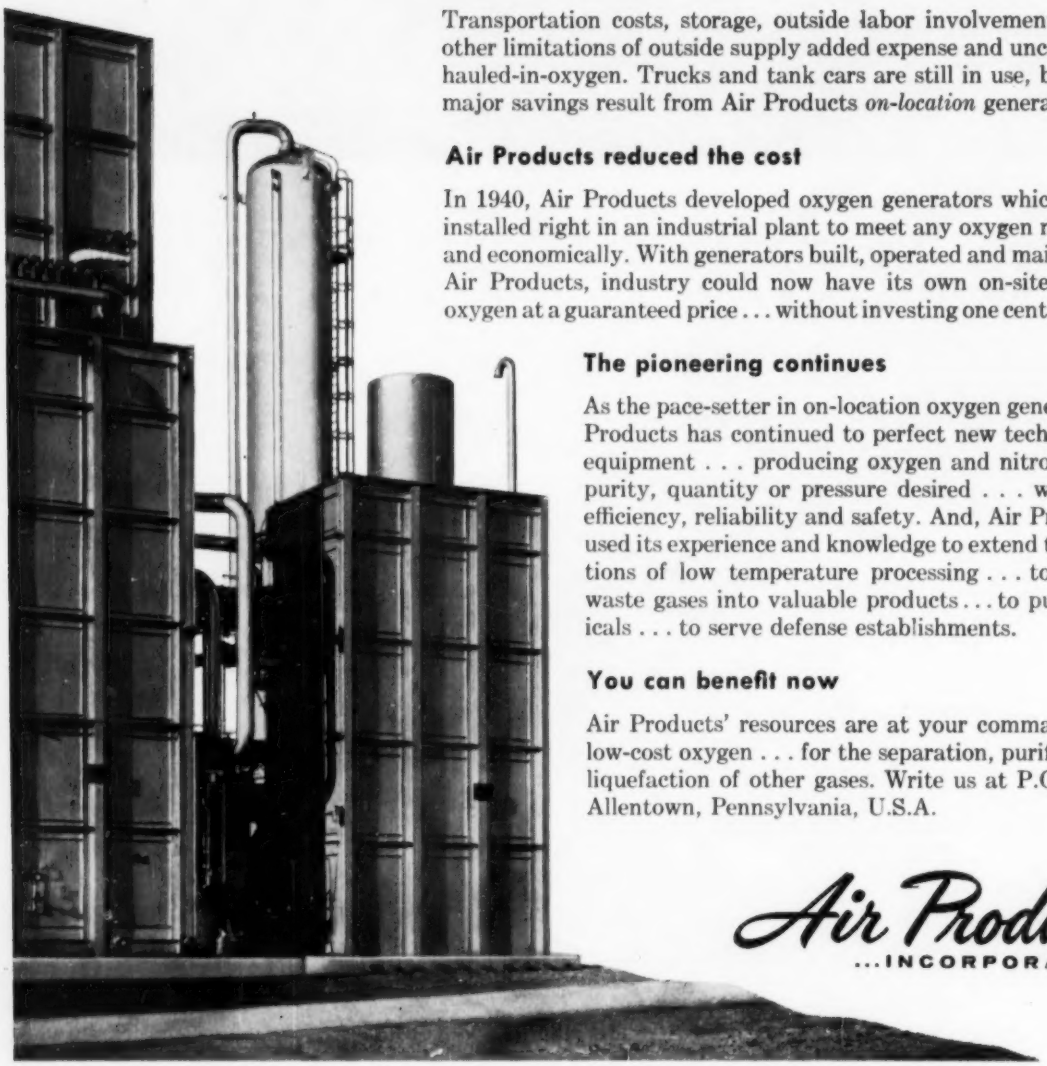
Oxygen isn't the high-priced chemical it used to be. Now, it's a low-priced tonnage commodity—a utility purchased like electricity or water. The price drop is the *real reason* oxygen usage has climbed beyond 70 billion cubic feet per year.

Why was it costly?

Transportation costs, storage, outside labor involvements and the other limitations of outside supply added expense and uncertainty to hauled-in-oxygen. Trucks and tank cars are still in use, but today's major savings result from Air Products *on-location* generation.

Air Products reduced the cost

In 1940, Air Products developed oxygen generators which could be installed right in an industrial plant to meet any oxygen need, safely and economically. With generators built, operated and maintained by Air Products, industry could now have its own on-site supply of oxygen at a guaranteed price . . . without investing one cent of capital.



The pioneering continues

As the pace-setter in on-location oxygen generation, Air Products has continued to perfect new techniques and equipment . . . producing oxygen and nitrogen in any purity, quantity or pressure desired . . . with greater efficiency, reliability and safety. And, Air Products has used its experience and knowledge to extend the applications of low temperature processing . . . to transform waste gases into valuable products . . . to purify chemicals . . . to serve defense establishments.

You can benefit now

Air Products' resources are at your command . . . for low-cost oxygen . . . for the separation, purification and liquefaction of other gases. Write us at P.O. Box 538, Allentown, Pennsylvania, U.S.A.

Air Products
...INCORPORATED

Hundreds of Air Products package generators and tonnage plants are now on stream . . . capacities range from 216,000 cu. ft. per month to 360,000,000 cu. ft. per month.

WORLD TRENDS

CENTER OF THE STAGE

A crucial drama of money will be played out over the next few months. The course of business in many nations will be affected by the denouement.

At center stage is Chancellor of the Exchequer Peter Thorneycroft, who has vowed to defend the pound sterling with all Britain's strength. To do that, he says Britain is prepared to keep money tighter than ever, to risk strikes, unemployment, even deflation. Britain, Thorneycroft insists, will not devalue.

This was the mood as the world's "money managers" went home after their late September meetings in Washington: international determination to ride out today's financial troubles without abandoning orthodox tight monetary and fiscal policies. But despite official assurances, you can hardly blame those businessmen who are not yet convinced that there will be no major changes in European currencies.

Actually, sterling seems safe for the next two months or so. After that, predictions are impossible.

The problem, of course, is whether orthodox policies can restrain inflation at home and speculation abroad without tipping the British economy toward deflation. This goes for many other countries, too. And for all the official discussion of the inflation menace, many of the experts at Washington will not be surprised if the deflation menace is on the agenda next year.

THE PRICE DILEMMA

If you are getting much less for your copper, how can you pay much more for wire, tubing, and other things made from copper?

This is the dilemma of the raw material producers. Labor costs are still rising, helping to push the prices of finished goods to new highs. But prices of key raw materials are sinking. The commodity prices often reflect oversupply; finished goods reflect pyramiding processing and higher service costs.

Nations depending on the export of one or two primary products are gravely concerned about their ability to earn enough from exports to keep ambitious development plans going ahead.

Which trend will prevail? You'll see part of the answer in the next few months' experience in Britain.

What is happening to important industrial raw materials?

The **price of copper** probably will not drop much further. Marginal mines are closing down; and with the supply picture better, producers are counting on an "inevitable" rise in demand.

The bitter battle between **natural and synthetic rubber** continues, and is spreading around the world. Goaded by the fluctuating price and uncertain long-term supply of natural, the industry is expanding synthetic facilities in many nations.

Elsewhere, there is a mixed picture: U. S. producers have sliced $3 a ton off **sulfur prices** to meet the challenge of Mexican domes, now producing 1-million tons yearly. A real battle is shaping up . . . The **price of tungsten** dropped precipitately as U. S. stockpiling ended. In tungsten as well as

Turn the page for more WORLD TRENDS

other materials, the U. S. government's stockpile promises to be much less of a prop under prices . . . **Steel scrap** prices, soaring after Suez, have dropped down hard; **wool, coffee, zinc and lead prices** are off. . . . There is plenty of **aluminum,** and the producers are pushing hard for new markets and new uses. Note the contract between Esso Standard Oil Co. and Reynolds Metals Co. (both of the U. S. A.) for some 35-million aluminum lubricating oil cans per year—a major market breakthrough for the light metal.

RUSHING TO EUROPE

Britain and Europe seem to be getting a larger share of U.S. private investment this year (page 15). By year-end, book value of total direct investment there by U.S. companies may pass $4,000-million, up 14% over 1956.

Many American manufacturers are speeding plans to invest in European branches, or to join with European partners and licensees. These plans, remember, have not yet shown up in the investment statistics. Meanwhile, many more firms are still deciding what they should do about their European markets.

Fear of being at a competitive disadvantage vis-a-vis the Common Market and Free Trade Area is the most obvious single factor in the rush. But, more important is U.S. businessmen's confidence in continued growth of European consumer markets and industrial activity.

"Serious-minded companies," remarks one Washington official, "have made their decisions to go to Europe whether or not there is to be a Common Market."

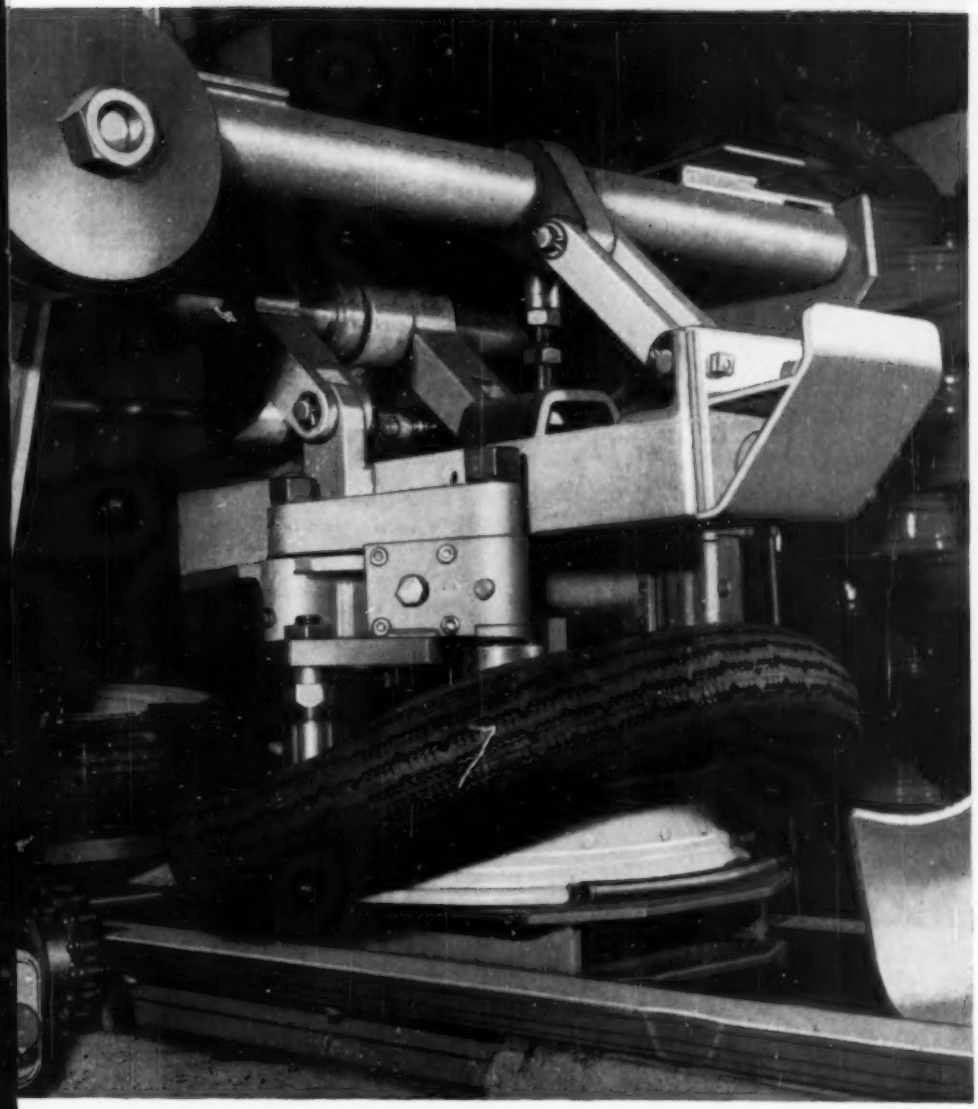
BUSINESS IN BRIEF

What may be the **first successful vaccine against the common cold** has been developed in the U.S.A. A Johns Hopkins University scientist has isolated a virus that accounts for 30% of the colds observed by the research team over two years. There's a lot of work yet to be done, but in the end, it may reduce the $5,000-million in lost time that U. S. industry pays each year for the cold.

Want an air-liner? The resale market for used transport aircraft is weakening fast as airlines search for buyers (especially overseas) for their sturdy but obsolescent planes. Top price for a twin-engine DC-3, which brought $175,000 a year ago, is now about $135,000; DC-4's are off $100,000 to about $450,000; others proportionately. Prices are likely to slide further in the next year or so.

Industry has taken to **hiring professional philosophers** out of the universities, reports *Business Week.* Not that management believes in "Philosopher Presidents," rather it finds good use for these specialists in identifying company goals and guiding policy towards them. And insurance companies use logicians to discover "internal contradictions" in complex policies, while electronics manufacturers find them helpful in computer design.

Israel is emphasizing management education. A team from New York University will help establish undergraduate business courses, graduate management and executive training programs . . . The second edition of **the United States World Trade Fair** is scheduled for May 7-17 in New York. The first drew 3,000 exhibitors and 127,000 buyers—and helped sell imported consumer goods in the U. S. A. (MD, June 16). . . . Don't wait too long to set up your visit to the **World's Fair in Brussels,** beginning next April. Preferred accommodations are becoming scarce.



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RÉGIE NATIONALE

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"Self mounting" tyres

Régie Renault Plant at Flins is the most modern of European
omotive concerns.

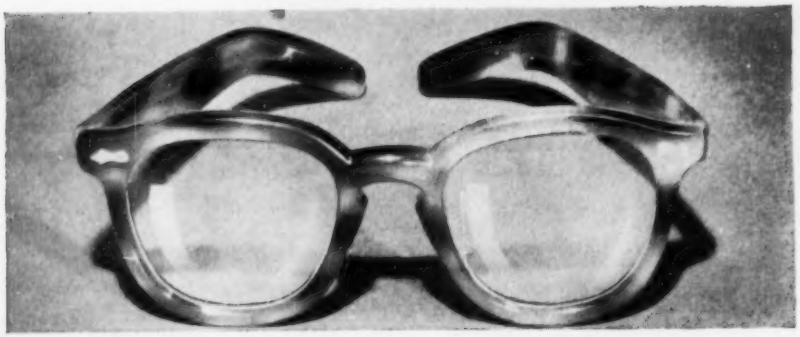
Every day, however you look at it, 800 Dauphines require 4,000 wheels; the question which comes up to one's mind is : how to mount and assemble so many tyres efficiently ?

At Flins, where the Dauphines are born, the following facilities have been made available :

- *A rolling conveyor delivers the rims to an automatic tyre distributor.*
- *Next, four rollers come into action like hands : with one mighty pressure, they will fit the tyre securely on the rim.*
- *An automatic inflating machine completes the cycle and stops all by itself when the required pressure is attained.*
- *The operators watch the operations.*

That is all there is to it and the cycle is repeated at the rate of

1 wheel every 7 seconds



from **AMERICAN OPTICAL**

to **ZENITH**

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- Wide color range
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- Form retention
- Superior toughness
- Good weatherability
- Superior moldability
- Machinability without cracking or crazing
- Freedom from objectionable odor

Remember, we supply Celanese technical skills, as well. Ask your Amcel representative for the full, rewarding facts on Forticel. Now.

Forticel®

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Austria, Vienna XIX . . . Eugen Farber . . . Chemicals, plastics, resins, C. A. & textile products.
Belgium, Brussels . . . Keyser & MacKay . . . Resins.
Belgium, Gand. . . . Cocentra S.P.R.L. . . . Chemicals, plastics & C. A.
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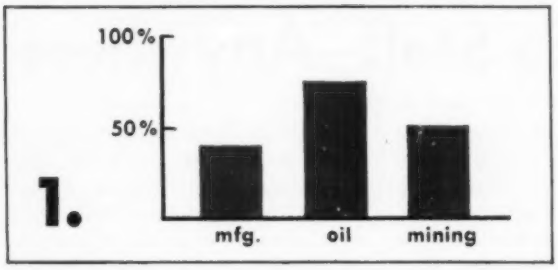
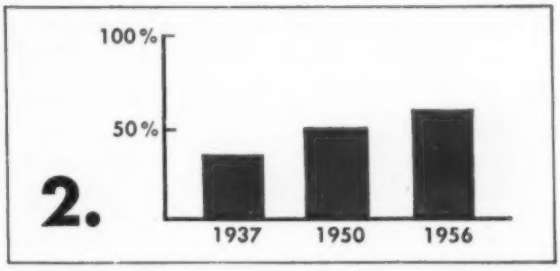
Hong Kong . . . Getz Bros. & Co. . . . Textile products.
India, Bombay...Banwari Lal & Co., Ltd....Chemicals, plastics, resins C. A. & textile products.
Indonesia, Djakarta-Kota . . . . . N. V. Agung . . . Chemicals, plastics & resins.
Israel, Tel-Aviv . . . Manfred Gottesmann . . . Chemicals, plastics, resins & textile products.
Italy, Milano . . . . Euramerica S. R. L. . . . . Resins.
Italy, Milano . . . Usvico (Societa Industriale Commerciale) . . . Chemicals, plastics & textile products.
Japan, Tokyo . . . . Percy Breen . . . . . Plastics.
Japan, Tokyo . . . A. R. Brown, McFarlane & Co., Ltd. . . . Resins.
Korea, Seoul . . . Bando Trading Co., Ltd. . . . Plastics & resins.
Korea, Seoul . . . Celastar Textile Co. . . . . Textile products.
Lebanon, Beirut . . . A. Sahmarani Freres . . . Textile products.
Malaya, Kuala Lumpur...Getz Bros. & Co....Chemicals, plastics & resins.
Malaya, Singapore . . . Getz Bros. & Co. . . . Chemicals, plastics, resins & textile products.
New Zealand, Auckland . . . Hardie Trading Co. (N.Z.) Ltd. . . . Plastics & resins.
Norway, Oslo . . . . Christen Hoeg . . . . . Chemicals.
Philippines, Manila . . . . . Union Trade Distributors . . . Plastics & resins.
Philippines, Manila . . . . . F. E. Zuellig Co., Inc. . . . Chemicals & textile products.
Rhodesia, Bulawayo . . . . . John Beith (Rhodesia) Pvt. Ltd. . . . Chemicals.
So. Africa, Durban (Portuguese East Africa, Nyasaland) . . . John Beith (S. A.) Pty. Ltd. . . . Chemicals.
So. Africa, Johannesburg . . . . J. J. Allman Sales Corp. . . . Plastics & resins.
Spain, Barcelona . . . Extractor Curtientes y Productos Quimicos, S. A. . . . Chemicals, plastics & resins.
Sweden, Alvenas Valberg . . . . . Svenska Rayon Aktiebolaget . . . Textile products.
Sweden, Stockholm . . . A. B. Metall & Bergprodukter . . . Chemicals.
Sweden, Stockholm . . . . Scandinavian Raw Materials . . . Plastics.
Switzerland, Basel . . . . . Chemische Fabrik Schweizerhall A. G. . . . Chemicals, plastics, resins & C. A.
Switzerland, Zurich . . . . . Walter Aebli & Co. . . . . Textile products,
Syria, Damascus . . . . . Sahmarani Hammour & Cie . . . . Textile products.
Taiwan (Formosa), Taipei . . . Dah Chung Trading Co. . . . Chemicals, plastics, resins & textile products.
Thailand, Bangkok . . . F. E. Zuellig Ltd. . . . . Chemicals & textile products.
Vietnam (So.) Saigon & Laos . . . Getz Bros. & Co. (Vietnam) . . . Chemicals, plastics & resins.
West Germany, Hamburg...Karl O. Helm...Chemicals.
West Germany, Hamburg . . . Plastica Repenning K. G. . . . Plastics.

AMCEL CO., INC., 180 MADISON AVENUE, NEW YORK 16, N. Y.
AFFILIATE OF CELANESE CORPORATION OF AMERICA

Canadian Prime Minister Diefenbaker (left), and his government, are worrying about these two problems . . .





U S. control of Canadian industry . . . heavier dependence on exports to the U. S. A.

Can Canada Break Away?

"The 20th Century Belongs to Canada" has been a favorite slogan of two generations of Canadians. The nation's sturdy growth seems to have justified their optimism. Today, however, thoughtful Canadians are asking: "But who does Canada belong to?"

Many will answer—with a wry smile—"the United States." The U. S. A. is looming ever larger in both Canada's trade and in the ownership of its business enterprises. Canadians believe they must limit the impact of the American economy on their own.

On a platform of "Canadian business for Canadians" and "More trade with the Commonwealth," the Progressive Conservative party upset 22 years of Liberal party rule last June, and installed John Diefenbaker (above) as Prime Minister. For the last two months, Diefenbaker and his government have been in close contact with Britons, Americans, Europeans, and Commonwealth officials, wondering how they may fulfill the promises of the recent election campaign.

Businessmen everywhere are taking note. A broader base for Canadian trade could mean fresh business opportunities for many nations.

Here are some of the ideas, realistic and not-so-realistic, that Canadians are discussing this month:

—**Shift 15% of Canada's U. S. purchases** to imports from Britain. On the basis of 1956 trade, this would amount to $600-million or more.

—**Encourage, perhaps force, U. S.-controlled enterprises** in Canada to further "Canadianize" themselves.

—**Find an important place for Canadian goods** in the emerging European trade community.

—**Strengthen Canada's ties** with all Commonwealth lands, especially the less developed countries of Asia and Africa.

—**Review Canada's strict adherence** to liberal tariff policies—especially vis-a-vis the U. S.

All this is a lot easier said than done.

The physical, economic, and cultural ties that bind the U. S. and Canada are strong. Canada provides a vast land, rich in resources and in the ability (if not the numbers) of its people. Its huge, friendly neighbor provides a big appetite for raw materials, venturesome businessmen, and the world's highest living standard for Canadians to emulate.

Canadian economic policies have been called a "model for modern industrial development." As such, they have included an "open door" for foreign investment. The Yankees have needed no urging.

Trade has become intimately intertwined. The problem is a familiar one to economists: The fast-developing Canadian economy has sucked in many more goods from the U. S. A. than the U. S. A. has been prepared to buy from Canada. The resulting trade deficit—a yawning $1,200-million last year—has been offset by the mighty rush of U. S. investment dollars.

Diverting Canadian trade away from the U. S. will be difficult with-

out the kind of discriminatory, physical controls that Canadians dislike. Furthermore, much of what Canada has been buying—coal, scrap metal, certain machinery—has not been available outside the U.S.A. The many U.S. branch plants in Canada prefer U.S. equipment. And Canadian consumers are more likely to eat fresh fruits and vegetables shipped up from the U.S. than canned or frozen varieties from Australia or South Africa.

On the other side of the coin, where can Canada find markets for its goods at the prices—in hard Canadian dollars—that its domestic cost structure demands? In the crucial matter of wheat exports, can Canada compete with the U.S.A.'s surplus disposal, or somehow persuade the Americans to share the market?

Indeed, many Canadians and Americans are convinced that the U.S. and Canada are going to have to live together in as close, or even closer, an economic relationship as they have today.

No one—including the Diefenbaker government—knows precisely how Canada can greatly loosen its trade ties with the U.S. Time, and continuing economic development, may divert some trade. Each year, Canada becomes more self-sufficient in many lines; the capital goods coming from the U.S.A. strengthen Canada's capacity to supply world markets as well as its own. Of course, if Canada decided to put tight import controls on U.S. goods, diversion could be gained—at a price.

Meanwhile, Canada's politicians, and its able corps of trade commissioners abroad, will attempt to persuade Britain to sell harder in Canada, and buy more there. Ottawa will try to forge some link between Canada, the Commonwealth, and the European Free Trade Area. The nation will work even more closely with, and extend more assistance to, emerging nations such as Nigeria, Ghana, the West Indies, as well as the Southeast Asian Commonwealth countries; since the war, $500-million in Canadian economic aid has helped spread Canadian equipment and techniques in these areas. Likely, too, is a much stronger trade effort in Latin America. ●

Most Foreign Students in U.S. . . .

Come From . . .

	NUMBER OF STUDENTS
Canada	5,379
China	3,055
Korea	2,307
India	2,144
Japan	1,870
Philippine Islands	1,714
Mexico	1,358
Iran	1,264
Greece	1,064
Colombia	963

. . . And Study

	NUMBER OF STUDENTS
Engineering	9,057
Humanities	8,524
Social Sciences	5,859
Natural & Physical Sciences	5,372
Medical Science	3,854
Business Administration	3,485
Education	1,982
Agriculture	1,469

Data for 1956-57. Institute of International Education.

IIE Finds Staff—Anywhere

Digested from BUSINESS WEEK, Sept7, p160

Nearly all companies today like to staff overseas plants with nationals from the country where the plants are located (MD, Aug, p51). But many American firms try to staff their foreign branches with nationals trained in the U. S. A.—just as a British company, like Courtaulds Ltd., will recruit for its U.S. house Americans who have studied in England or Germany.

Where can an American manager find a list of U. S.-trained nationals for his Venezuelan or Indian branch? Many go in the first place to the International Institute of Education, New York. This is a non-profit organization founded in 1919 to help promote international understanding. Its principal task, besides promoting international scholarship programs, has been to encourage the exchange of American and foreign students.

Now—thanks to increasing international business operation—IIE has become virtually an international employment agency, a middleman for helping companies (as well as universities and government bodies) locate foreigners who have studied in the U. S. A. It has also kept track of American students who have gone abroad to foreign universities.

For U. S. companies building or expanding overseas, IIE's service is invaluable. Altogether more than 40,000 foreign students attended American colleges last year. (The charts above show the 10 leading countries sending students, with their major fields of study.) IIE reports that most of the students return to their own countries—and thus become candidates for employment with U. S., other foreign, or even domestic companies looking for promising young men or women to staff their overseas plants.

Of particular help in this talent-scouting operation is IIE's 7-year-old Central Index of Educational Exchanges. This is a machine punch-card system which lists over 200,000 foreigners who have studied in the U. S. for over 10 weeks, as well as some 25,000 Americans who have studied abroad. Information on each listed person includes sex, occupation, schooling, nationality and address.

A company needing help contacts IIE, describes what type of staff it wants, gets IIE's estimate of the people available and the cost of preparing the names, then orders a report to be made.

For instance, a few months ago Standard Oil Co. of New Jersey wanted a list of students from Peru, Colombia, and Venezuela now studying medicine, nursing, and sanitary engineering in the U. S. A. IIE provided a detailed list of 132 names—at a cost of only $35.

There are difficulties in the system, of course—chiefly that of keeping track of changes of address. Also, the listings do not tell whether a man or woman is looking for a job. But IIE will shortly begin a job survey of previously listed students, and of students beginning their studies in the U.S. this fall. ●

The Care and Feeding of Engineers

A world shortage is still with us. Management's problem is to better understand the technical man, and use him more efficiently.

TECHNICAL MEN crowded the employment center of the American Chemical Society at its recent meeting in New York. Over 600 men applied for job interviews, 25% more than last year. On the same day big-city newspapers discussed the curtailment of defense expenditures by the U.S. Congress: Some projects were lopped off the budget, others spread over a longer period of time.

What do these events mean in respect to the much-debated shortage of technical manpower? Is the scarcity over? With less U. S. Government spending, will there be an excess supply of engineers in the U. S. A.? Will more American technical men be available for jobs in other areas of the world?

No pat answer will have meaning. Many people will argue that the "crisis" shortage of engineers, especially in the U.S.A., was never real: It was based more on expected demand than on the requirements of industrial production, research and development. Part of the "shortage" was a clamoring by big companies for the best talent, as research increased at an unprecedented rate.

The engineer shortage in other countries appears more critical and pressing. Countries such as Sweden and Norway have had to postpone research projects and drop new product developments in order to release manpower for increased production, the magazine *Product Engineering* discloses in a survey of engineering problems in Europe and Asia. Australia is trying to reduce the impact of the shortage by 400 licensing agreements for U.S.-developed products.

Wherever one looks engineers are in demand, *Product Engineering* reports. Italy has good mechanical men, but lacks petroleum and electronic engineering talent. Germany—racing ahead industrially—can use another 50,000 graduate engineers. Dutch firms have enticed American engineers, while Japan complains that U.S. industry is stealing its top electronic specialists.

The spotlight is on the technical man today, notwithstanding any temporary ups and downs in national economies.

Who is this engineer who has inherited the world? He is a man of scientific knowledge, but he is a far cry from the scientist or philosopher of several years ago. He is several steps up the ladder from the technician who executes his plans. He is a professional, and in recent years, has become a specialist in a multitude of fields.

Not long ago all engineers were civil engineers, and a little later, there were two kinds of engineers, civil and mechanical. Today there is a sharply-defined engineering job for each technology pursued. Besides industrial engineers, chemical engineers, electrical engineers, there are callings for those who specialize in electronics, nucleonics, radio and communications. Employment agencies ask for ultrasonic engineers, computer engineers, and design engineers, among many others. Some specialists, concerned with the relations between men and machines, call themselves "human engineers."

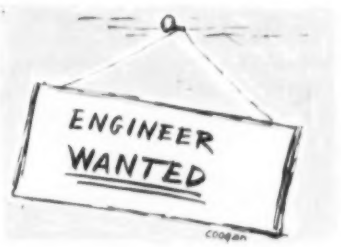
But despite the diversity of his work, the modern engineer has been found to have characteristics common to his kind. Studies have probed his likes and dislikes, his temperament, talents and productivity. Aware of present and future engineering shortages, these investigations have attempted to find out just what type of man goes into engineering, what qualifications students must have to seek the profession, and just how much of an engineer's time is spent in doing truly engineering work.

One of the most recent of these surveys, conducted by the New York consulting firm Deutsch & Shea, shows the engineer as a highly intelligent but non-intellectual specimen. The typical engi-

The typical engineer is precise, tense, and very responsible . . .

. . . he is work-oriented, immune to most normal distractions . . .

. . . too often his skills are wasted, his time not effectively used . . .



. . . and everywhere in the world he is—and will be—in short supply.

neer, their report states, is a "strongly work-oriented, precise, tense, energetic, practical individual with little interest in intangible questions." He has little vision beyond the immediate problem, but he respects authority and has a strong sense of responsibility.

The modern American engineer identifies himself more with his profession than his employer. As such, he is sensitive to recognition, and often critical of the relation of his department to other departments. He might question whether or not there is a "shortage" of engineers, with the claim that his talents are not being properly used at his present job.

In a study titled "The Relationship of Utilization to the Shortage of Scientists", four investigators of the University of California corroborate this last view. They surveyed about 150 employees of electronic and aviation plants. Replies showed that the average engineer feels that he uses only 21% of his time on work suited to his unique abilities, 23% on routine activities, and 56% of his time on dubious activities such as conferences, report writing, etc.

The authors of the survey estimate that further creative output is lost through engineers working on problems duplicated elsewhere, through work distractions and employee turnover. They conclude that engineering productivity in the field surveyed accounts for only 8% of working time.

The same percentage can not be fairly extended to other industries, but available evidence indicates that there is a substantial waste of technical talent everywhere.

Steps for reducing waste and eliminating the shortage by increasing engineers' productivity have been outlined by nine graduate students of Harvard University's Graduate School of Business Administration. Their report, *Engineering Manpower: How to Improve Its Productivity*, analyzes existing practices in industry and suggests certain basic improvements:

1. Improve Communications

Engineers have been baffled as to the relationship of their department to others. A clear definition of the position of the engineering department in the company is required. Engineers must know where they fit into operations and what is going on in other departments. Poor communication leads to misunderstanding, confusion on work priorities, decreased productivity, and bad morale.

The investigators recommend that management arrange discussion conferences to heighten the engineer's understanding of his place in the organization. Management also must select the best internal organization for its engineering department, and coordinate its functions with those of other departments.

2. Plan Ahead

The report notes that most companies do not plan effectively. Successful engineering projects often are wasted because they are not coordinated with marketing and sales objectives. Poor planning also results in engineers doing work that technicians or semi-skilled men and women could do just as well.

Managers can improve planning in these ways:

— Instruct engineers as to management's objectives, so that time will not be lost in pursuing methods inconsistent with company's needs.

— Encourage engineers' suggestions, comments and criticisms.

— Act promptly in appraising and evaluating the recommendations of the engineering department.

3. Avoid Overhiring

Hoarding of engineers often occurs because executives can not gage the urgency of their engineering personnel needs. The remedy is greater familiarity with the work and problems of the engineering department. A better understanding of what available manpower can accomplish will reduce requests for unnecessary personnel.

Effective hiring techniques are recommended by the Harvard students. These would include job-applicant interviews by representatives thoroughly familiar with the skills required, and the services of professional employment agencies.

4. Train for Leadership

Though many firms have on-the-job training programs, many companies are deficient in carrying out such training. To secure increased productivity, management must set the training goals and provide an adequate program for achieving them.

Management must evaluate engineers not only in terms of technical competence, but as to their supervisory and administrative ability. Likely candidates should be given special training and encouraged to accept authority delegated to them.

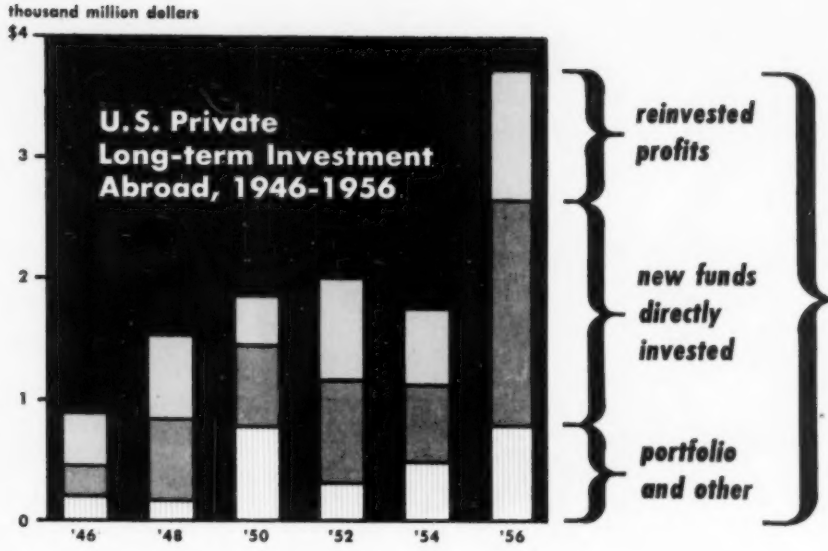
5. Keep Salaries in Line

In conclusion, the Harvard investigators point out that compensation affects motivation and, in turn, productivity. Engineers should be rewarded in proportion to their contribution to the company's success. A frequent complaint of engineers is that their salary is regulated by personnel men rather than engineering supervisors, and raises are based on seniority rather than merit.

Coupled with increased productivity must be an expanded plan to recruit more people into engineering and technology. The need for such a program in the U.S.A. was stressed some months ago in testimony before the Joint Economic Committee of Congress. Robert T. Sheen, spokesman for the instrument industry, called for a program that would upgrade high-school teaching, establish new technical institutes and provide engineering extension courses in Universities.

Money spent for research and product development in 1958 may or may not top the figures for 1957 ($7,000-million in the U. S. A.)— but engineers still will be much in demand throughout the world. More engineers will be needed and their productivity will have to be increased.

Engineers will be needed, irrespective of the ups and downs of industrial output, because of the dynamic things that are happening in the world today. They will be needed to design and produce ultrasonic planes, nuclear plants, dresses made from coal, electricity from hydrogen and oxygen. ●



Total new funds investea in foreign nations by U. S. business surged upward last year; the rise has continued into 1957. But these are net figures: Total capital spending by Americans abroad is much greater.

More Yankee Dollars on the March

WORRY ABOUT TRADE and currency problems over the past few months (MD, Oct, p7) has obscured a significant trend in world business: the unprecedented increase in U. S. private investment abroad.

Final figures (chart above) show a record upsurge in Yankee investment for 1956. What is more, estimates for the first half of 1957 indicate that the increase may be equally large this year. All this despite heavy, persistent demand for capital in the U. S. A.

After hovering around $1,000-million for 10 years, total outflow of new funds from the U. S. A. shot up to $2,600-million last year.

Reinvestment of American businessmen's overseas earnings, averaging about $600-million since 1947, rose to almost $1,000-million.

Few persons believe that U. S. private investment, in and of itself, can right the world's dollar imbalance. And it is argued that the outflow of that investment is, in part at least, a result of trade and currency problems. In order to enlarge, or to retain, many markets, U. S. corporations believe they are obliged to begin manufacturing locally—within the market.

Yet this rising American private investment is of tremendous importance to the world economy. It is providing a major source of financing for the high level of U. S. exports. More important, the U. S. government points out that "an unusually large part" of this investment is providing liquid dollar resources for foreign nations.

And it is a good deal larger than is generally recognized. For example, the total U. S. private investment last year—$3,600-million—is a net figure: new investment minus the proceeds of old investments liquidated and returned to the U. S. A. That tends to understate the full economic impact of new funds. Also, official net figures do not cover such important forms of investment as exploration and development costs charged off.

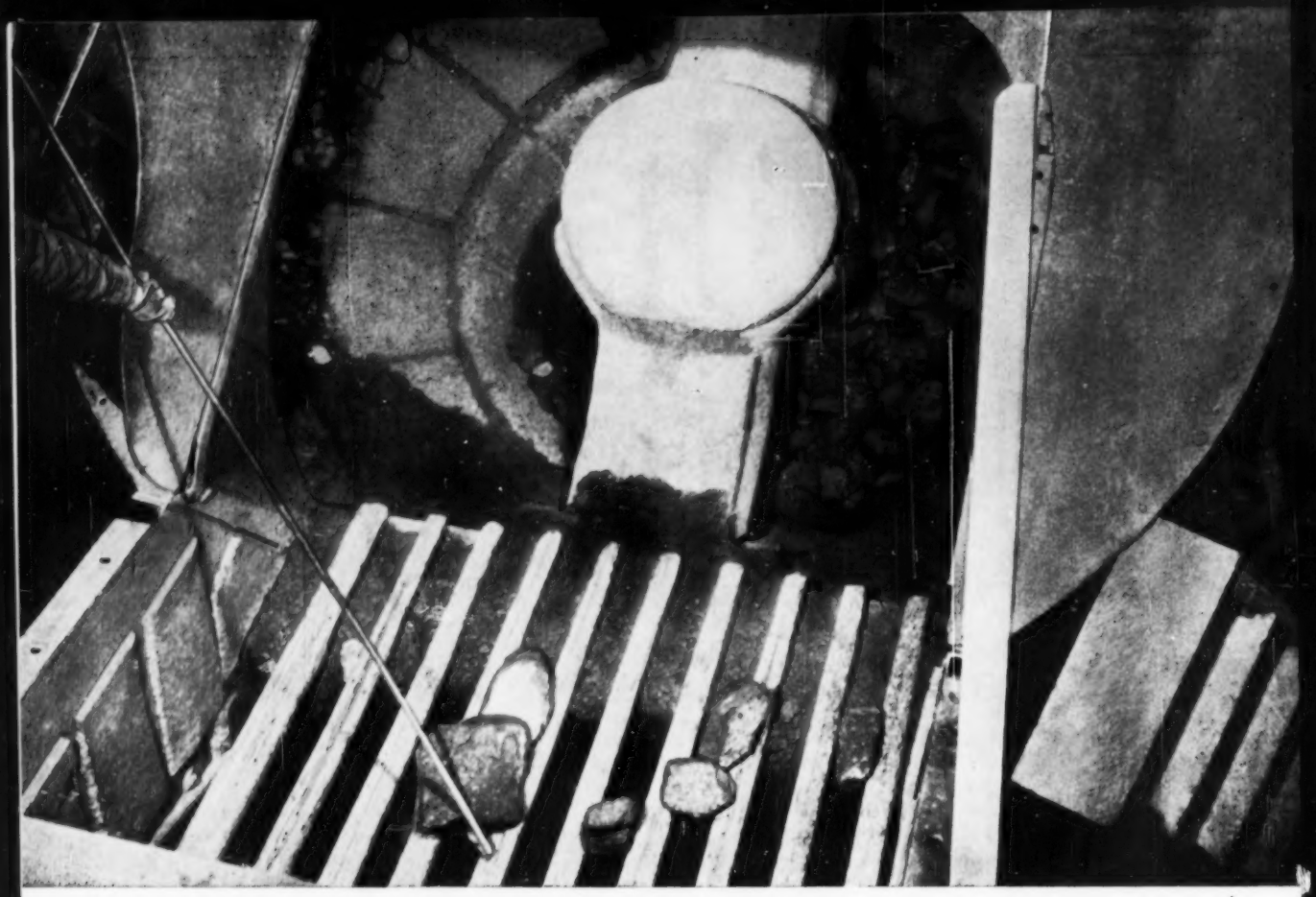
Indeed, two competent students of investment, writing in the July issue of the quarterly *Foreign Affairs*, estimate that gross capital spending abroad by American firms last year was closer to $5,000-million than to $3,600-million.

Total investment holdings abroad are understated, too—simply because official figures are carried at book value, generally much lower than replacement cost or market value. Thus the book value of total U. S. overseas private investment—carried at $33,000-million—reflects a market valuation of perhaps $50,000-million.

The impact of this investment—in terms of employment, new production, tax payments—had been little understood until earlier this year, when the U. S. government produced a pioneering study of U. S. investment in Latin America (MD, April, p15). This study reinforced the idea that in terms of its volume and its economic impact, U. S. investment overseas is consistently under-estimated.

In its September *Monthly Letter*, the First National City Bank of New York comments on the frequently-heard complaint that U. S. private investment is unduly concentrated in the "developed," industrialized nations. Not quite so, says the Bank. The record shows that direct investment has been fairly evenly divided between "developed" and "undeveloped" lands. In the 1950-1956 period, less than two-thirds of the increase in direct investment went to the industrial areas of Europe, Canada, Japan, South Africa, Australasia.

Another criticism of U. S. investment is that it is too heavily concentrated in extractive industries, especially oil. To be sure, petroleum operations have accounted for the largest part of direct investment (with Venezuela the largest single recipient). However, the last few years show a sharp rise in general manufacturing investment (up a record $740-million in 1956).



General Electric equipment keeps it working...

ON A MINERAL DIET

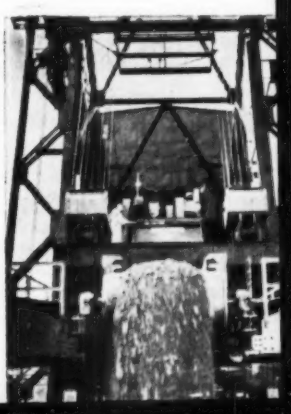
General Electric helps mining meet production demar ds

Raw chunks of ore on their way to a refined product start through the business end of a crusher like this. It takes power and plenty of it to grind today's volume of ore. For instance, when White Pine Copper huge ore grinders — among the largest in the world — required special drive motors, General Electric had the answer in 1500 hp giants with synchronous drive. But General Electric equipment doesn't just work in the mill.

Out of the ground comes the ore with General Electric helping shovels to perform faster and more smoothly. For G-E amplidyne control means faster shovel response and no excessive torque, thus stepping up yardage and cutting maintenance downtime.

To waiting maws goes ore under G-E power. When G-E motors drive conveyors, unloaders, car dumpers, a steady stream of material is assured. Integrated G-E components provide the highest operating efficiency wherever materials handling is the problem.

"All under control" describes these operations with a General Electric coordinated electrical system. With flexible, yet integrated components from packaged substations to switchgear, General Electric designs economy and increased production into mining from coal to taconite. Yet all the G-E facilities are ready for your problem, too. Just consult your G-E representative, or write: *International General Electric Co., Dept. 57-38, 150 East 42nd Street, New York 17, N. Y., U. S. A.*



GENERAL ELECTRIC

—U. S. A.—

Businessmen depend more and more on their lawyers' skill. That is a well known fact. It is less well known that it takes skill to be a good client. Here is a guide to. . . .

Getting the Most Out of Lawyers

Digested from HARVARD BUSINESS REVIEW, Sept-Oct, p61

THE LAWYER'S FUNCTION is to counsel, negotiate, arbitrate, litigate, conciliate. But much more, the lawyer's professional concern is human conflict—to foresee, avoid, and resolve.

To get the most from a lawyer's service, a business man must be a skilled client. He must be able to select the right man and be able to work with him. It is not as easy as you might think.

I. Referring Problems

Some problems, of course, are simple. When a businessman is served with a summons, he knows whom to call. And a lawyer is automatically called when there is a tax question or when a contract is broken.

It is also widely recognized that agreements should either be drafted or reviewed by a lawyer. And bargaining positions should be subject to his specialized scrutiny—it wouldn't do for a negotiator to demand exact performance of a contract only to discover that some legal technicality (a statute of limitations, for instance) rendered the contract unenforceable.

For more subtle problems, it is difficult to know when to call in a lawyer. But the answer is simple in principle: If a competent attorney is fully aware of his client's programs and objectives, he realizes before the client does how he can be of aid.

An attorney who identifies broadly with his client's interests relates current events and reads his law journals with the affairs of the company in mind. He should be as widely, if not as thoroughly, informed as top management about policies, plans, and actions.

Ideally, management should establish a systematic procedure for keeping its lawyer in close contact with company operations. He should either attend policy meetings or be supplied with a memorandum. He should be on the route list for all top-level memoranda.

Management should ask him to periodically review all mercantile procedures. He should advise on routine business forms, and set up standards for the administration of security and credit programs.

But it is up to management to define the lawyer's responsibilities. He serves as a staff man. And like all staff men, he must understand the limits of his authority and responsibility.

Remember, it is the client, not the lawyer, who has final responsibility for deciding whether to go to court or not. A lawyer can appraise the hazards, but nothing more. The client also must approve any compromise settlements, and this question should be thoroughly explored at the outset.

Once these preliminary matters are settled, however, the lawyer's role is necessarily paramount. It is he—and not the client—who must develop the theory for the case. It is the lawyer who must ultimately decide what evidence to prepare and whether, when, and how to introduce it before the court or government agency. In litigation it is never possible to predict what will have to be done, in what manner, or how quickly. The lawyer must be given broad discretion in these matters.

II. The Lawyer's Dilemma

The crux of the lawyer's dilemma is this: He might approve what the courts will later forbid, thus putting his client in jeopardy. But on the other hand, there is an equal danger he might discourage what the courts would permit.

The lawyer might be unable to say with assurance whether a contemplated project would be ruled illegal per se, or whether it would be judged by the rule of reason—the business reasons for making the move. And if reasonableness should be the criterion, he may be unable to point out the specific legal standards against which the reasonableness would be measured. Furthermore, the lawyer would be unable to know whether the project would be challenged by a private party or by a government agency. And he probably would be unable to say what the penalty would be if the court ruled against the company.

The best answer to this dilemma is that risk is part of business. If a firm is guided by timid predictions about what the courts might hold unlawful in the future, rather than by reasoned applications of the law as pronounced, the company—and the public—may suffer.

As a client, a business man would not be making full use of his lawyer unless he obtained a recommendation on the final business decision—whether the risk is too great for the client to take a chance. And to give an intelligent opinion, the lawyer must combine his expert legal judgment with all pertinent business factors.

III. Insider vs. Outsider

Obviously, a staff lawyer has more knowledge of his client's—or his employer's—business than outside counsel has. A staff man has the further advantage in that he spends less time getting the facts. He either knows the facts or knows where he can get them fast. He is in a position to take responsibility

for the facts as well as the law.

Furthermore, a staff attorney develops close relations with other executives—which facilitates understanding and communication. And since he knows the men he works with, he is usually less restrained in his opinions and feels less need to make qualifications.

There is a danger, though, that an inside lawyer will become too partisan. To say the least, there can be times when a staff lawyer will have to make a vigorous effort to avoid wishful thinking about the state of the law—especially if he is being pressed for an opinion.

On such occasions, outside counsel can provide the experienced, independent guidance needed.

Outside lawyers, of course, are used by companies of all sizes. The small company usually has to depend on them. Many large firms leave day-to-day chores to a law staff, call in outside counsel for services of greater moment. The fact is that it is difficult to staff a law department to handle every kind of legal question.

Actually, whether to hire a full-time staff lawyer or not is a real question only for medium-size firms. The answer depends on management's need. But there is one strong advantage that shouldn't be overlooked: With a salaried lawyer on hand, there is no reason —of economy or convenience—to forego legal advice on seemingly trivial matters.

IV. Picking the Man

In choosing a lawyer, his competence as a legal expert should be your first consideration. But providing traditional legal services is not always enough. Management demands much of its lawyers today. Many corporations—and most big ones—want a man who is capable of measuring corporate policy against public opinion. A lawyer should be aware of law "in the making."

New laws affecting business—antitrust laws, for example—usually result from the interaction of economists, legislators, businessmen, and the public. And a good lawyer can often influence the shaping of new laws by working with legislators and government administrators.

So management should seek in a lawyer both political sensitivity and technical talent; and fully as important, it should look for disciplined courage.

It is not, however, an easy matter to evaluate a lawyer. The reputation of his clients is one indication of a lawyer's reputation. And discreet inquiries can be made among these clients.

You can also find out if the lawyer is active in bar affairs. Has he ever participated in legal forums? What is his training?

And while it is generally not done, there is no good reason why you cannot ask such questions to the lawyer directly. A good lawyer should not resent legitimate inquiries.

Once you have settled on a lawyer, remember he will need help. Someone must examine the files for correspondence, memoranda, contract forms, etc. As his client, you should learn at the earliest possible moment just what your lawyer needs. Responsibilities for helping the lawyer should be fixed at the beginning.

For instance, an economist might be needed to help prepare a defense for a law suit, or statistical studies might have to be prepared. Remember that the lawyer's function is contention, not objective analysis. His duty is to present one side of an issue as forcefully as he can. Staff men working with a lawyer must be prepared to help him select data. ●

Management "Man of the Year"

Adriano Olivetti (above), Italy's dynamic manufacturer of office equipment, has received yet another honor. Last month he was proclaimed "International Management Man of 1957" by U. S. A.'s National Management Assn.

Signor Olivetti was scheduled to accept the award at the organization's annual convention on October 25. The citation is presented annually to the "foreign industrialist who has done the most outstanding job of promoting free enterprise."

"Il Padrone" — as Olivetti is known to his workers—is famous for his practical application of the Christian religion. "Christianity in action," he recently told a reporter, "integrates employees and employer into the same spiritual world and so creates a favorable atmosphere for the development of mutual understanding and respect." He was cited by the NMA for his successful fight against Communism in and around the two Olivetti plants in Italy.

Like the man it honors, the NMA has concentrated on building mutual understanding and respect in business. Starting out as the National Association of Foremen in 1922, the organization is credited with a major role in bringing about recognition of foremen as a part of management. It became NMA last year.

The NMA now says it is the biggest management organization in the world—76,000 members and 360 clubs—and it is still growing. Officials believe its success is due to a strict policy of helping managers become better managers: 75% of club meetings must be educational.

Someday the NMA may become a world-wide management group; but right now, officials say, there are enough opportunities in the U. S., Canada, and Puerto Rico to keep NMA busy for the next few years. However, outsiders are welcome to join as individual members ($10 per year).

Adriano Olivetti joins a distinguished roster of international businessmen honored by NMA since 1952: J. R. D. Tata of India, Count Francisco Matarazzo of Brazil, Antonio Ruiz Galindo of Mexico, Lord Percy Mills of Britain, Norris Crump of Canada. ●

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Compare These 9 Ways To Reproduce

	SPEED	NUMBER OF COPIES	CONVENIENCE	APPEARANCE	FLEXIBILITY	ART WORK
TYPING WITH CARBONS	Quickest – for four or five copies. Just type it once, and the job is done.	Four or five is about maximum. For more copies, re-type.	Excellent, if you need only a few copies.	Non-uniform. Top sheet is clear, but copies are blurred.	Poor. Limited to a few copies of text only.	By hand, on each copy.
PHOTOGRAPHIC DUPLICATING	Reasonably fast. Not recommended for "on-the-spot" copying, but volume work.	Unlimited. Ideal for preparing "intermediates" for volume direct-process prints.	Fair. Most larger firms maintain centralized facilities.	Excellent. Often better than typed original.	Excellent. Can reproduce anything.	Excellent. Can reproduce anything.
PHOTOCOPYING	Excellent. As many as five copies per minute.	Up to five copies per matrix. Not practical for over 30 copies of original.	Excellent. May be performed in normal room light.	Good to excellent. Not quite as clear as conventional photography.	Most units can reproduce from typed, drawn, printed, or written original.	Line copy – excellent. Halftone reproduction, only fair.
XEROGRAPHY	Exact copy within 3 minutes.	Up to 8 copies per exposure. Masters (for offset, spirit, or ammonia-vapor) for 10,000 copies or more.	True copies. Good as standard office copying equipment.	Good direct positive, facsimile reproduction on material of your choice.	Excellent. Wide range of applications.	Line copy, lettering, drawings, sketches, charts, halftones.
AMMONIA VAPOR	Time to type original, plus 10 to 120 seconds or more for each copy.	Hundreds. Limited only by quality of original transparency.	Good. Equipment available in most drafting departments.	Usually blue-line. Other colors available. Tough, rugged paper.	Good. Can reproduce almost anything, if on a transparency.	Line drawings, sketches, or screened photos.
SPIRIT DUPLICATING	Very fast, once original is prepared. A few hundred copies in minutes.	A few hundred.	Excellent. Some chance of smudging fingers or clothing.	Usually purple. Other colors available. Successive copies progressively lighter.	Excellent. Makes up to a few hundred copies of text, sketches, drawings.	Line drawings or sketches. No photos.
STENCIL DUPLICATING	↓	Thousands.	Good if text only. Not so good if drawings are required.	Uniform, clear copies if equipment and techniques are good.	Fair. Special drafting technique needed for drawings.	Line work only. No solid tone areas. No photos.
OFFSET PRINTING	Fast, when using direct-image plates or in-plant duplicator. Some delay with out-of-plant printer.	Tens of thousands. ↓	Fair. Printer can show you how to save time and money. ↓	From fair to top-quality, slick-paper, multi-color job.	Excellent. Can reproduce almost anything, any size. ↓	With photo-offset, anything. With direct-image, no photos; drawings same size.
LETTERPRESS PRINTING	Subject to delay with out-of-plant printer.			From fair to top-quality, slick-paper multi-color job. Sharp, crisp halftones and dense blacks.		Anything.

Paperwork

COST	RECOMMENDED FOR:
Cheapest – for four or five copies. Just type it once.	Three or four copies, where speed and economy are important.
10 to 15 cents each. For preparation of "intermediates," negligible.	High-quality copies; "intermediates" for volume direct-process prints. Permits size changes between original and final.
From 2½ to 10 ¢ per copy.	"On-the-spot" copying when no more than 30 copies of one original are needed.
A few cents each for single or few copies. Very low for 10,000 or more copies.	Single or multiple copies of office forms, documents, records, charts, drawings.
A few cents each.	A few tough, rugged copies for heavy-duty use.
Fraction of a cent each, if at least 20-25 copies.	A few hundred copies, especially when drawings go in with text.
	Thousands of copies, mostly text, where good looks and low cost are required.
Low with in-plant duplicator and direct-image plates. Medium to high with outside printer.	Large printings. Gives professional appearance at reasonable cost.
Medium to high with outside printer. Photos and drawings often more expensive than with offset.	Highest quality appearance.

What You Should Know About Copying Methods

Even a glance at the chart tells you one thing: There are lots of ways to reproduce paperwork such as memos, letters, bulletins, drawings, what have you. Each method has its own best uses. And costs vary with the kind of job and number of copies you want.

The use of carbon copies is standard procedure all over the world, and little explanation is needed. Also, the advantages of exact photographic duplicating are unique enough to stand alone.

But to make the chart (prepared by *Factory Management & Maintenance*) easier to use, it is handy to make some competitive groupings. In general, letterpress printing competes with offset printing; stencil duplicating competes with spirit duplicating; and there is close competition between photocopying, xerography, and ammonia vapor (diazo) machines.

I. New Copying Machines

The *Wall Street Journal* recently devoted a front page story to the new copying machines: Tremendous progress has been made in this field in the last few years. According to the *Journal*, duplicating office processes have been around a long time. But office technicians differentiate between these and the photo and diazo copying machines. Duplicators have their best use where hundreds of copies may be required. Copying machines generally are for one to 10 copies.

Businessmen see in these copying machines a long-awaited chance to cut down on the routine office paperwork that takes up so much of their time—and the time of secretaries and office workers. New uses for the machines are mushrooming.

Basically, continues the *Journal*, copying machines may be divided into three families: The electrostatic machines; diazo-type machines, which require a master copy on specially-treated paper for reproduction; and photocopy machines, which copy almost any printed matter you stuff into them.

The smallest machines aren't any bigger than a tape recorder and carry a price tag as low as $150. Generally, though, the desk type machine sells for around $350 to $500. Larger floor-type machines range to several thousand dollars.

Costs of single copies with these machines range from 2½¢ to 10¢ each for materials. Since the diazo type machines are cheaper for larger runs, they usually are preferred where a user desires a systems machine—one which will do a few jobs with many copies.

The diazo machines use paper coated with a dye chemical for reproducing material. With this type of machine you prepare your freight bill, blueprint, or any other master copy using special transcribing paper or film. From this film you can reproduce exact copies indefinitely in seconds.

A. O. Smith Corp. of Milwaukee (U.S.A.) uses this method for making copies of purchase orders, reducing errors and speeding the job. International Business Machines Corp. produces visual training aids, among other numerous applications.

By making copies on such machines, one division of Bristol Co., Waterbury, Conn. (U.S.A.) cuts clerical time and costs by 85% in its order-invoice operation.

The photocopy machine produces copies of almost anything on paper which might slip into the machine, with exceptions which vary between makes. Some may not produce unless carbon is in the inks on the original. Others may not reproduce if copy is on both sides of a page as with a newspaper. But there are machines which pick up colors and which can reproduce one side of a newspaper or magazine page.

To give only one example of how photocopying machines are being used, the *Journal* tells how a sales manager, in answer to a request for money from a salesman on the road, simply scrawls in pencil across the salesmen's memo, "O.K., money enclosed." His secretary then makes a copy of the memo, scrawl and all, in seconds on a photocopy machine. The copy goes into the file, while the

original is routed to the cashier's department for forwarding with check to the salesman.

"This eliminates dictating and transcribing a letter," explains the sales manager. Such informal letter writing—giving the writer his letter or memo back with answer scrawled or typed on the bottom—is rapidly spreading through American business as a cost-cutting measure in situations where full letters can be avoided.

Xerography (coined of Greek words meaning "dry" and "writing") uses electrostatic charges to copy materials. There are dozens of manufacturers making this equipment under license from two pioneers of the field, Haloid Co. and Radio Corp. of America.

Factory notes that the quality of a xerograph reproduction—as with the other copying machines—depends on the original. Letters, lines, sketches, charts, drawings, halftones, and areas of solid black reproduce well. Text, drawings, and halftones can be combined. Changes and corrections can be made by eradication and paste-up.

II. Duplicating Machines

Despite these new developments, there is still much to be said for mimeographing with a stencil. Production is high, of course. And you can put line drawings, tables, charts, curves, sketches, or signatures right on the stencil.

For art work, you will need a final sketch of each drawing, of the same size it will have in the final copies. To transfer art work to the stencil you will need a writing plate, correction fluid, and a set of styluses—and there are wheel styluses for making any required broken and dotted lines.

A spirit duplicator is a modified dye-transfer process. Firm, clear work can be achieved by using a stiff backing sheet, by selecting a clean typewriter type, and by adjusting pressure and fluid on the machine. Modern machines will print hundreds of copies—up to 120 per minute.

For general duplicating, spirit duplicating rates excellent on convenience and flexibility. You can combine drawings, sketches, curves, charts, handwriting, and typing as easily as on an ordinary sheet of paper. You can run five-color copies, from one original—by using a selection of colored backing carbons.

III. Competitive Printing

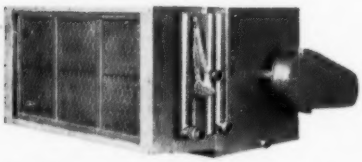
Letterpress printing is what most people think of when they speak of printing. It is in competition with photo-offset printing. And both usually require the service and advice of a professional printer. If your printing is primarily text, with only a few drawings, your printer may recommend letterpress for economy. With many illustrations, he may recommend offset if superior letterpress reproduction is not needed.

Offset plates can be made by photographing carefully prepared typewritten pages or pages composed by the printer.

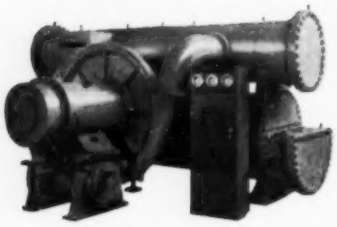
Offset printing is not as complicated as it sounds. In fact, the method is so simple that many companies have built a complete reproduction department around one small offset press. ●

American Blower Air-Conditioning Units for Industrial and Commercial Use

Send for detailed bulletins



CABINET-TYPE Central-Station Air-Conditioning Units for summer cooling and dehumidifying, and for winter heating. Bulletin 8527.



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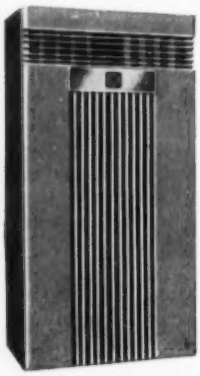
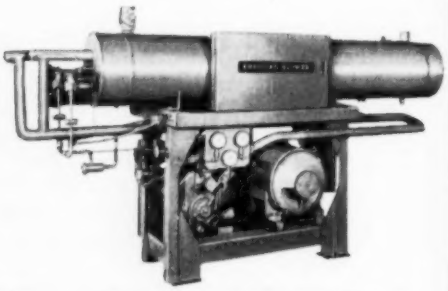


PACKAGED AIR CONDITIONERS for city water or cooling tower. Install with plenum or duct work. 3- to 20-ton capacities, sound-insulated. Bulletin 6125.



PACKAGED WATER CHILLERS for air-conditioning or industrial applications. 20- to 150-ton capacities. Bulletin 5925.

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In Management

● **NARROWING PROFIT MARGINS** have once again put U. S. businessmen on the warpath to cut costs—and inflation-harried managers everywhere know why.

The cycle is familiar. When business is going well, everybody is too busy making money to worry about extra expenses and minor costs. But when profits dip, cost-cutting starts. This year's campaign is not as rigid as 1954 or 1949, businessmen report, but a poor fourth quarter could intensify the campaign.

Usually, a company's program starts in its manufacturing operations, where direct costs can be attacked. But soon it sweeps through the company, trimming overhead in any form—phone bills, expense accounts, unnecessary jobs, and paperwork. As yet, however, few U. S. businessmen admit to cutting back on research or sales expenses.

Many companies are trying to set up cost-control procedures that will survive the emergency campaign. (*Business Week*, Sept 7, p 77)

● **"GOODS WELL BOUGHT** are half sold," commented Eric J. Wain of the Canadian Association of Purchasing Agents in calling for professional recognition of the purchasing manager. Purchasing has come into its own as a vital company department, Wain says, and requires professionals of its own—just like engineering or accounting.

Attesting to the purchasing manager's increased stature are the purchasing courses being started by business schools. Another citation is a new weekly newspaper starting publication next January in the U. S. A. McGraw-Hill's *Purchasing Week* will cover news developments and problems of concern to this newest profession.

● **MANAGEMENT TECHNIQUES** and leadership skills will be taught at India's new Administrative Staff College, Hyderabad, modelled on Britain's Henley College program. This project is the latest sign of the trend toward practical management education around the world.

Executives from all fields of business—60 to a class—will meet for three-month sessions. ●

new window air conditioner!

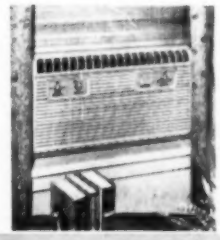
COMPACT, YET COOLS LARGE ROOMS!

mounts flush outside, extends only 4½" into room

For a powerful window air conditioner, the Airtemp Imperial Model is wonderfully compact.

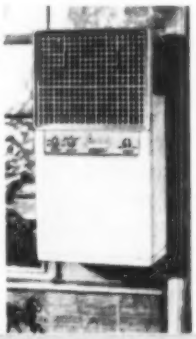
Outside the building it is flush with the wall . . . inside, it extends only 4½" into room. Yet the Imperial is available in ½-, ¾-, and 1-hp. models and so can cool sizable rooms.

No plumbing is required . . . only an electrical outlet and a sleeve for the unit. Needs little maintenance . . . only normal cleaning and oiling. Famous Chrysler Corporation engineering assures dependability. These features make the Imperial adaptable to any type of new construction.



Airtemp's casement-window room air conditioners are available in ½- and ¾-horsepower Custom and Custom Royal models.

Airtemp's conventional-type room air conditioners are available in ¾-, 1-, 1½-, and 2-horsepower Custom and Custom Royal models.



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Please send me complete information on Chrysler Airtemp room air conditioners.

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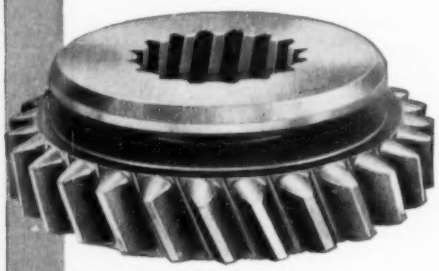
BALL STUD

Use of Copperweld 8640 Leaded improved automatic screw machine production nearly 40% for a large job shop. Production per machine hour increased from 108 to 150 pieces.



SPUR GEAR

A machine tool manufacturer cut machining time ⅓ by switching to Copperweld 4140 Leaded. And finish was greatly improved—from FAIR to EXCELLENT.

SPIRAL GEAR

Machinability was increased 25% when Copperweld 4140 Leaded was substituted for non-leaded AISI equivalent. Biggest saving from a cost standpoint was a 75% improvement in tool life.

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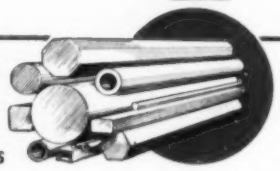


Cliques offer social satisfaction and a sense of status to their members—and they hold the key to productivity and morale. Here is how to . . .

Get the Cliques on Your Side

Digested from PERSONNEL, Sept-Oct, p38

THERE ARE TWO TYPES of organization in any business: formal and informal. The formal organization is based on the lines of authority delegated from top to bottom. The informal organization arises from social interactions without regard to the formal hierarchy—and management must have an understanding of this informal organization and how it operates.

At this stage in our knowledge, however, it is not possible to reduce informal organization to a simple formula, or to draw up a specific set of rules for management to follow. But it is well known that the "clique" system often holds the key to productivity and morale in the office and plant.

Cliques form at all levels in an enterprise—among policy-making executives, first and second line supervisors, workers, and technicians. These groups determine the over-all pattern of social organization in a company. But the problem clique is the small group: the three girls in the payroll department, the five girls in assembly, the four men on drill presses, or the six planning clerks.

These cliques can have considerable influence over their members—more influence, as a rule, than the formal organization. They enforce their own discipline by boycotting "offenders" from the social life of the work group, and even extend this boycott into the community.

Belonging to a clique gives the members social satisfaction and a sense of status. Clique members fear anything that threatens to upset the relationships that give them this security. Resistance to change is natural to a clique system.

Take this case. A new middle-management level was created in a growing factory. There was resentment among the older employees who had not been promoted. Even in a large organization, upgrading often has the effect of a demotion for others.

The older employees felt that their loyalty had been rewarded only by a loss of status—and it is understandable that they felt resentful. Old employees lined up against new ones, pro-supervisor against anti-supervisor. These cliques then took their toll in grievances, lower morale, and, ultimately, customer dissatisfaction.

Because these human feelings were "nonlogical"—they were not based on reason—the employees often complained about things completely unrelated to the real cause of their grievance. Some, who thought their efforts had been unrewarded, began to ask for pay increases. Others were absent more frequently. Before, these employees gave little thought to earnings or hours of work, but now they began to work their "eight hours, and no more."

In another case, a new incentive system was set up without the proper groundwork. Cliques immediately began "beating the standard" by controlling output. The cliques policed their own members who tried to produce too much; they "educated" new workers, no matter how inclined to cooperate with management. And management learned that no engineering standard is fool-proof if the workforce systematically sets out to cheat it.

On the other hand, cliques can become the ally of management. If they are "with" the company, management can ask for cooperation and get it, even for major innovations.

In one insurance company, for instance, an automation program was installed with complete cooperation from employees. Jobs were changed or eliminated, employees were transferred to new jobs or trained in new skills without appreciable discontent.

According to the company's president, the secret lay in letting employees know what was ahead, accepting their suggestions for making the transition easier, and keeping them informed of progress.

Above all, management kept in touch with employee opinion. Plans were changed and delayed, some canceled altogether where it seemed advisable.

If cliques are aligned toward company goals, their contribution is positive; if they are antagonistic, their influence is destructive. How can management bring cliques into a productive relationship with the company and its goals? Here are some guideposts:

—Management must accept the fact that cliques exist and cannot be ordered to "disband." They are based on sentiment, not logic. Whether they are friendly or hostile is up to management.

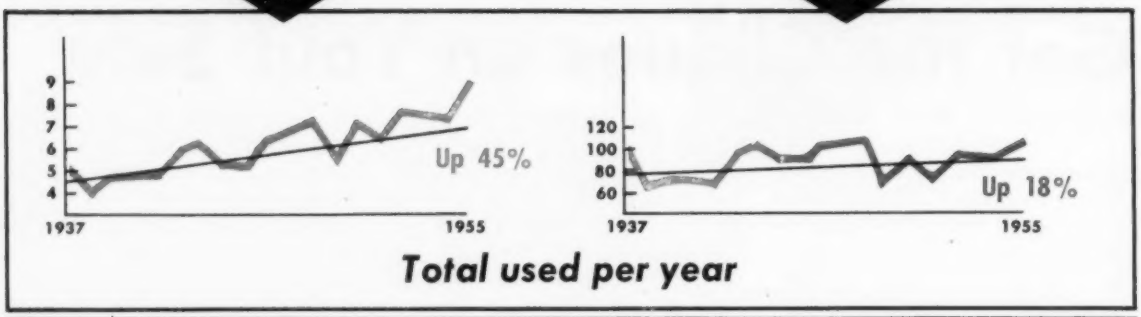
—Cliques are a vital element in productivity, especially in the office where verbal skills are emphasized and where there is more opportunity to communicate. It is important to give consideration to status symbols such as office space, telephones, desks, etc.

—Upward communications are important in keeping the informal organization on management's side. The real feelings and sentiments of employees should be made known to management, and accepted without ruffled sensibilities or indignation.

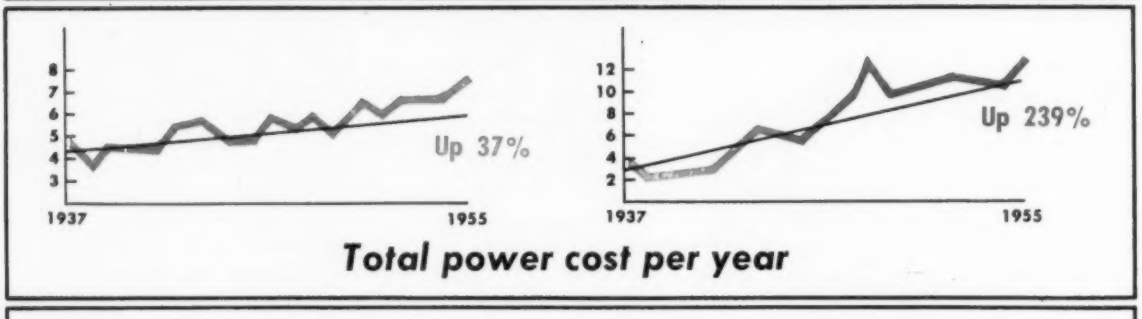
—Changes which affect the social organization of the office or plant cannot be made abruptly without increasing the risk of revolt. Such changes should be planned to enlist the support of the cliques. ●

ONE MILL'S RECORD: A 20-year effort to substitute low-cost electrical power for high-cost manpower — to increase productivity — produced these results. Production increased 62%.

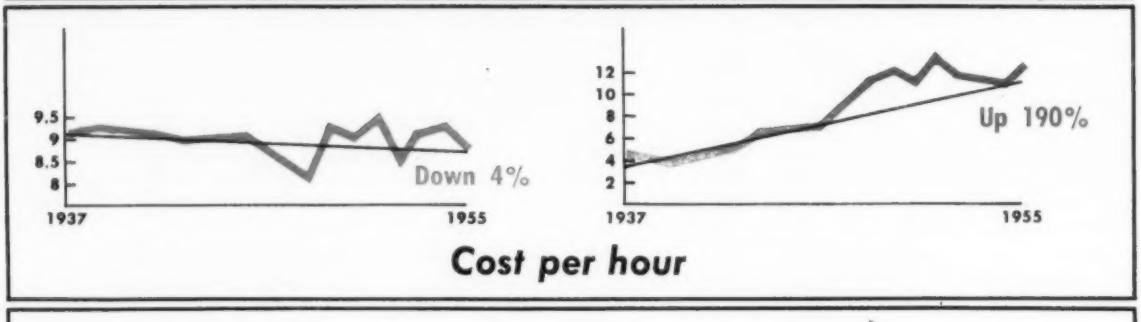
Kilowatt Hours . . . .vs. . . . Man Hours



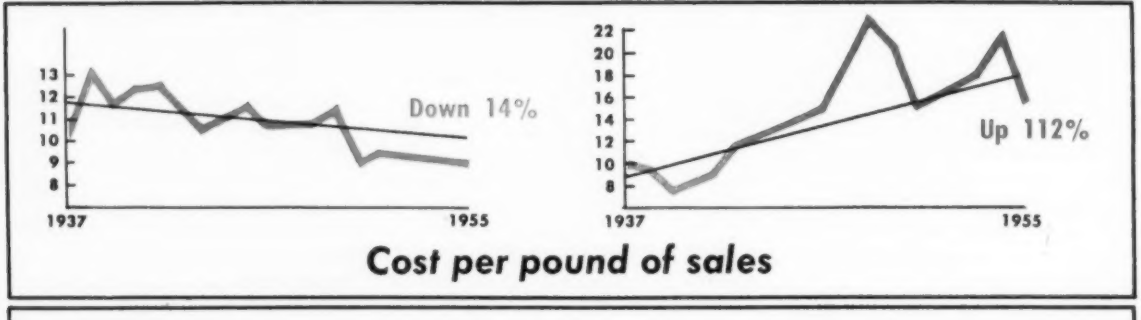
Total used per year



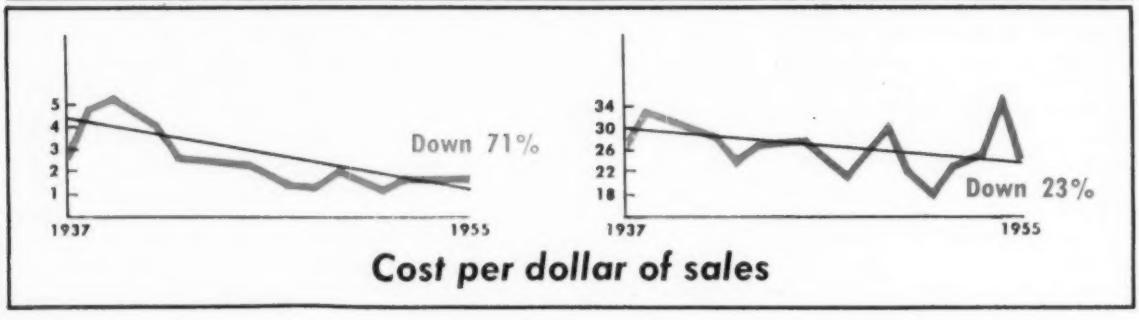
Total power cost per year



Cost per hour



Cost per pound of sales



Cost per dollar of sales

As productivity increases, so does the use of electrical power. Kilowatt hours vs. man hours is a valuable index of a plant's progress—regardless of product, size, or plant location—and provides. . . .

A Measure of Management

Digested from TEXTILE WORLD, Sept, p121

At first glance the charts on the left may not appear to be a measurement of management performance. Yet, if you think about them for a minute, their importance becomes clear.

Industrial improvements such as materials handling equipment, automation, and better lighting increase the amount of electric power at the same time they are reducing manual labor and—presumably—increasing productivity. The measure of management—as reflected by the charts—is the substitution of low-cost electrical power for high-cost manpower.

Analysis of these "power" factors will not guarantee a profit or a better return on investment. It will not help sales; it will not broaden markets. And it certainly will not substitute for management skill and judgment.

But such analysis promises to become an extremely useful management tool. It provides "bedrock" factors to measure management effectiveness over the long run. And the principle is the same for all manufacturing industries, regardless of products, location, size, physical layout. That makes it an ideal measure for interfirm comparisons (MD, Sept.). An alert management can see in what directions these basic power factors are moving, and whether they are moving as rapidly as they were last year, or 10 years ago.

The graphs were prepared from annual records of a successful North American textile mill. Throughout the period the mill operated approximately the same amount of production equipment (20,000 spinning spindles, 500 looms) and employed about the same number of people (550).

Trend lines drawn through the graph curves show the change over the 20-year period. The lines are drawn through the average for the first five years and last five years. However, in most cases the year 1953 is not included in the final five-year average—a hurricane knocked out the mill during this period.

The actual difference between 1937 and 1955 is much more dramatic than the percentages given in most cases. But even with the conservative change between five year averages, it is apparent that the mill has made progress in keeping labor costs under control during a period of rising prices.

On the same basis production during the period rose 62%. And as production rose, man hours increased 18%, kilowatt-hours 42% (see first chart). This shows that the mill increased its use of low-cost electrical power faster than its use of high-cost manpower.

The cost charts show some of the advantages of using electric power—reflecting efficiency. Total labor cost is up 239%, kilowatt hours only 37%—despite the greater use of electricity. The cost per hour of manpower increased 190%; electricity is 4% cheaper.

But if productivity had not been improved the man hour cost per pound of sales (up 112%)—see fourth graph—would have increased in direct proportion to the increase in the cost per man hour (up 190%). Likewise, the total labor cost would have jumped much more than 239%.

The cost per sales dollar is influenced by outside forces usually beyond the direct control of management—the effect of prices. An upward movement in this chart would indicate a dangerous trend—labor costs are getting out of hand, prices dropping to possibly disastrous levels, or both. Business dips can be identified by the sharp peaks on the man hour cost curve. (There were three major business dips for the textile industry during this period—in 1938, 1949, and 1954).

An even clearer picture of how a plant is progressing can be had by combining the two power factors into a ratio. For instance, the ratio of total kilowatt hours to total man hours: Mill records show this ratio was 4.87 in 1937—in other words, the mill was using 4.87 times as many kilowatt hours as man hours. By 1955 the figure had risen to 8.64, an actual increase of 81%—and 23% on the basis of first and last five years.

A similar ratio can be calculated for total cost of electrical power to total cost of labor. This ratio decreased 60% (five year average). That shows the cost of manpower rose much faster than the mill was able to substitute electrical power. This trend is also apparent from the graphs at left, but the ratio provides a single figure that can serve as an index.

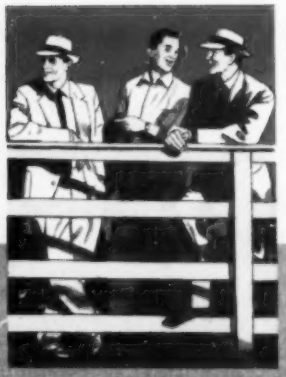
"Rate-of-change" ratios can provide an even more sensitive check. This ratio is obtained by dividing the value for one year into the value for the following year.

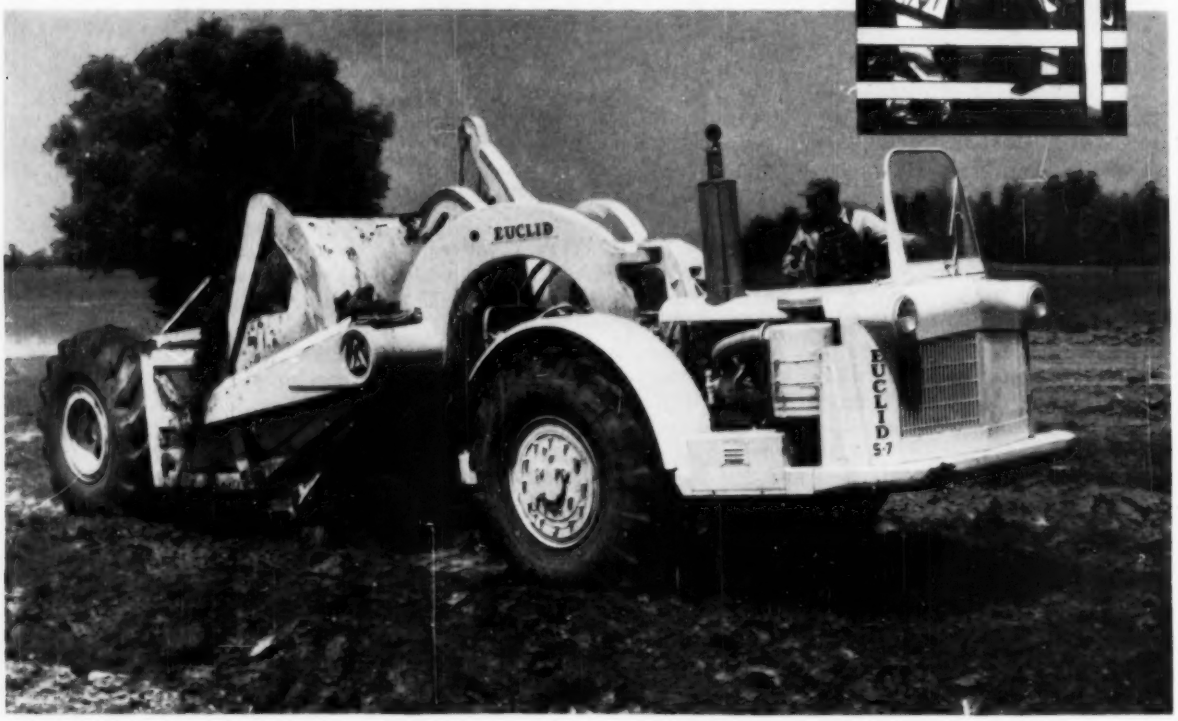
The ratio of kilowatt hours to man hours, for 1937 through 1940, was 4.87, 5.76, 6.25, and 6.45—a steady improvement. But the rate of change shows something else. The rate of improvement was slowing down during these years—1.19 (4.87 ÷ 5.76), 1.09, 1.03.

This is valuable information for management. Such trends cannot be reversed overnight. Improvements sometimes take several years to start paying off. And the mill's records show that the rate started climbing in 1943.

Trends also show up clearer if sharp annual fluctuations are smoothed out by using what statisticians call "moving averages centered"—each graph year would be an average including figures on each side of it. ●

Even Sidewalk Superintendents can see the difference!





To a casual observer most earthmoving equipment seems much the same... it's big, powerful and carries almost unbelievable loads. But although two machines are comparable specification-wise, they may be "miles" apart in performance.

Take this Model S-7 Euclid Scraper, for example. It looks like other scrapers but has no equal for work-ability. You can see it dig in and get the job done fast. With a payload capacity of 7 cu. yds. struck and a 143 h.p. diesel, the S-7 gets heaped loads easily... moves more yards per hour on a wide range of work—grading plant sites, road construction, industrial stockpiling, etc.

You'll find this versatile Euclid S-7 on large projects, too, as auxiliary equipment where small scrapers can be used to good advantage. Built for heavy service, it has exceptional maneuverability that's important for clean-up work on many highway, airport and dam projects, railroad relocation and similar jobs.

If you use crawler tractors, scrapers or off-highway haulers in your operations, check the complete Euclid line. Production and cost data are available from your Euclid dealer or we'll be glad to send you information that shows why ***Euclids are your best investment.***

GENERAL MOTORS OVERSEAS OPERATIONS
1775 Broadway, New York 19, N. Y., U. S. A.

EUCLID (GREAT BRITAIN) LIMITED
Newhouse, Lanarkshire, Scotland

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

▶ YOU AND YOUR PERSONAL AFFAIRS

Fortunately, influenza is a mild disease. You've probably gone to bed with it many times—your muscles ache, and there is high fever, a sore throat, dry cough, sometimes a nose bleed. After the fever subsides, you suffer from general weakness for a couple of days.

There is only one cure. Go to bed—and stay there until you feel strong enough to get up.

There are ways to ease your misery, though. Eat lightly and drink lots of liquids (except alcohol). Gargle with salt water (¼ teaspoon to half glass of water) to ease throat soreness. And two aspirin every four hours will help to pull down your fever. It also may help to keep the air in the sickroom slightly moist.

Most important, watch for signs of pneumonia. Call the doctor if coughing becomes wet and heavy, if lips turn blue, or breathing becomes rapid. Physicians say almost all deaths during flu epidemics result from secondary infections such as pneumonia. The danger is greatest for the very young, old, and infirm.

And heed this warning: Antibiotics—such as penicillin—are useless against the flu virus but very effective against pneumonia. Taking them before they are needed can be dangerous—bacteria in your body have a chance to build up resistance to the drugs. That could be fatal if a secondary infection sets in.

When you have the flu, your body builds up antibodies that guard against future attacks. Preventive vaccines work the same way.

But the flu virus is clever. It mutates. And last year's antibodies—or vaccine—will not always protect you against this year's virus. That's why the new "Asian" strain has claimed so many victims around the world.

Remember, it takes from 10 to 14 days for protective antibodies to build up after a "shot." There is also an unpleasant reaction in most people—such as after a typhoid shot. And if you are allergic to eggs, you had better steer clear of flu vaccine—it is grown in eggs.

For all these reasons, flu vaccine has never been very popular. But when a new epidemic threatens, it is a good idea for businessmen outside of epidemic areas to protect themselves and other important personnel. Likewise, a community should protect doctors, nurses, policemen, etc. The danger, of course, is that many "key men" will be out with the flu at the same time.

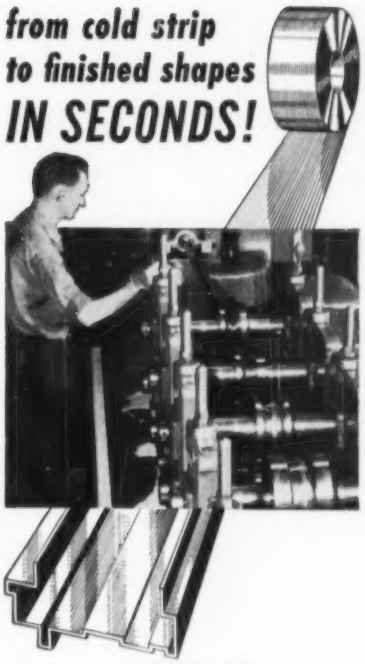
●

Products in the news. A new 8-mm. movie camera, developed by Longines-Wittnauer Watch Co., converts into its own projector in less than 30 seconds. Price: about $160. Another new 8-mm. movie camera, this one from Bell & Howell in the U. S. A., has automatic exposure adjustment—the light meter is coupled to the diaphragm. Price: about $170.

Note the price of diamond-tipped phonograph needles has recently been cut 40%. That is good news for record collectors. A diamond tip plays up to 1,000 hours, as compared to about 50 hours for a sapphire tip.

And what will they think of next? A U. S. distillery is test-marketing vodka in flavors—cherry, chocolate, orange.

from cold strip to finished shapes IN SECONDS!



YODER ROLL-FORMING MACHINES

If you are in the business of manufacturing a product that is, or could be, made wholly or partly from flat rolled metals in thicknesses up to ½", a Yoder Roll-Forming machine can help reduce your production costs.

Cold-formed shapes of every description—including structurals, tubular products, moldings, trim, roofing and siding, panels, cabinet shells, etc., can be produced on Yoder cold-roll forming equipment at the rate of 25,000 to 50,000 feet per day at a conversion cost of only a fraction of a penny per foot! With speeds and costs such as this, even part-time operation of a Yoder roll-forming line is a profitable investment!

Additional operations such as welding, coiling, ring forming, perforating, notching, embossing or cutting to length can be simultaneously introduced to the basic shape at little or no additional labor cost. Yoder engineers are at your service in explaining the advantages of roll-forming for your individual needs.

A new, revised, Fifth Edition of the Yoder Cold-Roll Forming book is just off the press. In addition to economic and mechanical possibilities of cold-roll forming, it contains numerous illustrations of end uses and applications of roll-formed shapes. Write for your copy today.

THE YODER COMPANY
5517 Walworth Ave. • Cleveland 2, Ohio

YODER COLD ROLL FORMING MACHINES

Glass is composed of almost all of the earth's basic elements.

GLASS...

...material of a million uses

Corning produces more than 50,000 *kinds* of glass which can be lighter than cork or as heavy as iron; strong as steel or as fragile as an eggshell; soft as cotton or as hard as precious stones.

In industry, Corning glass is put to work to solve every conceivable industrial problem. It insulates against or actually *conducts* electricity. It resists blazing heat, sub-arctic cold and deadly corrosive acids. Through research and high-speed automation methods, Corning meets the growing demands of science and industry everywhere for these marvelous glasses.

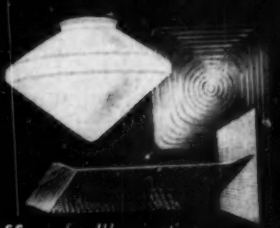
Let us show you how the truly marvelous properties of Corning glasses can help solve *your* manufacturing problems. Our technical and research staff will be happy to assist you.

***FREE**—For the idea-stimulating story of the role of Corning glass in industry, write for your copy of "Glass and You".*

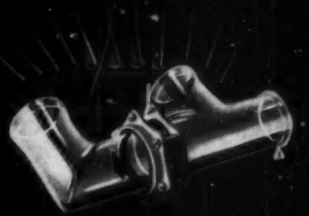
CORNING GLASS WORKS
International Division, Export Sales Department B-11
718 Fifth Avenue, New York 19, N. Y., U. S. A.

GLASS . . . *for Science and Research*
From heat-resistant laboratory glassware to giant precision optical lenses, Corning glass is an indispensable part of today's technological evolution.

GLASS . . . *for Electronics*
Metalized glass components for electronics include inductances, capacitors and bushings for radio, television and other electronic devices. Corning produces glass products for every conceivable electronic need.



GLASS . . . *for Illumination*
From Edison's first electric light bulb, blown by Corning in 1879, to these modern fluorescent lamps, Corning has helped roll back the curtain of night for man's victory over darkness.



GLASS . . . *for Industry*
Corning's glass piping is tough, resistant to the most corrosive chemical attack, and unaffected by severe thermal or mechanical shock.

CORNING GLASS WORK

What Makes Salesmen Successful?

One company collects "critical incidents" of good and bad selling—then draws up a performance checklist tailored to its own requirements.

Digested from PERSONNEL, Sept-Oct, p54

There is no shortage of opinion about what makes a good salesman. Facts are harder to come by. Indicators such as sales volume, number of calls made, number of orders taken provide some measure of over-all effectiveness. But they do not tell *why* a salesman is successful; nor do they yield many clues why one salesman is better than another.

There is a real need for measures of sales effectiveness based on job performance—such as the list below. With such information, it is possible to pinpoint areas of strength or weakness in selling. Checklists, appraisals by supervisors, self-appraisals, and similar methods can then be used to compare the actual behavior of salesmen with "model" behavior.

To find out what makes a salesman sell, the Minnesota Mining & Manufacturing Co., a U. S. company with over 1,000 salesmen and a broad product use, asked its sales managers—85 in four separate product divisions—to report "critical incidents" of effective or ineffective behavior among their salesmen.

Critical incidents are just what the name implies—behavior that proved to be the key to effective performance on the job; not routine activities, but rather those essentials in job performance which make the difference between success and failure.

The company believed its sales managers would be acquainted with many such incidents through day-to-day contact with their salesmen. This belief was confirmed. A total of 135 incidents were reported, of which 96 were usable—61 examples of effective performance, 35 ineffectives. The incidents were recorded in the form of anecdotes.

Here are five typical incidents: A salesman received a complaint from a customer about the quality of a particular type of industrial tape. He failed to look into the matter or write up a formal complaint. The defective tape was returned to the jobber and no credit was issued to the jobber or to the retailer involved. While the account was not lost, the customer was dissatisfied for a long time.

A large customer complained about our tape and decided to try out a competitor's tape. The complaint was justified and a substitution run was recommended. The salesman told the customer about this new run and said it would come in the next order. He did not tie this down with the jobber, however; the jobber shipped more of the old run when the customer's order came through. As a result, the customer felt that the salesman could not be trusted and withdrew his business.

A salesman driving down the street saw a truck containing equipment for which company products might be used. He followed the truck to find the delivery point, made a call on this account (a new one) and obtained an order.

A jobber account had been lost. The salesman made it a point to contact the account once a month for over a year, explaining company policy and showing that our products would be easier to sell. After a year, the jobber returned to the company.

A large plant working on a defense project suddenly discovered that they were out of belts of a certain length which had to be made to order. The salesman borrowed utility rolls of the correct width and grit from a jobber, took them to a woodworking plant which made endless belts, and had enough belts made to keep the defense project going.

When the incidents were grouped into broad, meaningful categories, the result was the list of 15 critical factors in selling. As might be expected, these factors were not represented in equal

15 critical factors in selling. . .
. . . analyzed from actual job performance

1. Following up:
   a. complaints
   b. requests
   c. orders
   d. leads
2. Planning ahead
3. Communicating all necessary information to sales managers.
4. Communicating truthful information to managers and customers.
5. Carrying out promises.
6. Persisting on difficult accounts.
7. Pointing out uses for other company products besides the salesman's own line.
8. Using new sales techniques.
9. Preventing price-cutting by dealers and customers.
10. Initiating selling ideas.
11. Knowing customer requirements.
12. Defending company policy.
13. Calling on new accounts.
14. Helping customers with equipment and displays.
15. Showing "non-passive" attitudes.

weight. Incidents involving "following up" were the most often cited. Another frequent incident involved persistence: Good salesmen do not give up easily—they tend to keep after difficult accounts. In addition, as a number of incidents indicated, they plan their activities well.

All 15 factors, however, were characteristics of the best salesmen in the company. To succeed, a salesman must handle all of them well. Failure in any one category could lead to failure on the entire job.

Minnesota Mining is following up this study with further research. It has prepared a rating sheet for salesmen. The sheet lists a series of statements about salesmen's behavior, such as:

—Allows too much credit to doubtful customers.

—Gossips about customers' confidential information.

—Writes poor sales reports.

—Assists fellow salesmen with displays, etc., when needed.

—Promises too much to customers.

—Is familiar with competitive products and sales methods.

Sales managers are asked: Would you agree or disagree with the statement if you heard it used to describe that person (a particular salesman)? The manager has his choice of Strongly Agree, Agree, Undecided, Disagree, or Strongly Disagree.

From this, the company hopes to develop criteria that will aid in validating tests for applicants to sales positions.

A major advantage of the "critical incident" approach, according to the company, is that it supplies "tailor-made" information based on the performance of its own employees. ●

Ads You Will Never See

There has been considerable psychological evidence that human beings are capable of subthreshold perception—defined by Webster's dictionary as perception "below the threshold of consciousness or beyond the reach of personal awareness."

And for the last year, advertising circles in the U.S.A. have buzzed with rumors about a new kind of "invisible" advertising that could sell products while leaving the buyers unaware they were getting a sales message.

The rumors became fact when a new U.S. company called Subliminal Projection Co., Inc., unveiled a process for projecting "invisible commercials on television and movie screens." The process makes use of a projector that flashes an advertising message while a program is actually in progress. The messages flash on and off so fast—every five seconds or so—that the viewer is unaware he has seen them.

That viewers can be stimulated—and stimulated to buy—by such commercials has been proved, claims Subliminal's president, James M. Vicary. In a test over a six-week period, Vicary raised sales of popcorn 57.7%, Coca-Cola 18.8%, in one movie theater by bombarding patrons with "invisible messages."

Subliminal Projection has applied for a patent, which Vicary says would be the first on "what is essentially a social invention." But another company, Experimental Films, Inc., promptly announced that it had filed a patent application before Vicary. But some skeptics doubt that either will get a patent.

There are still an immense number of technical difficulties to be solved. And at this point, only one thing is sure: Subliminal advertising has been brought into the open for debate.

Vicary insists that such advertising is "a very simple, logical idea"—that it would mean fewer interruptions and more entertainment time during commercial television broadcasts. And he claims it "would not prompt a viewer to buy something he didn't want."

But he admits that in the beginning he discarded the idea "as a rather frightening thought." And he anticipates that "the intellectuals will land hard on the idea."

Vicary suggests some of the criticism may be avoided by warning the audience in advance. ●

In Marketing

● **WORLD MARKETING** becomes increasingly competitive; no businessman can take his distributors for granted. As a result, many companies are making special efforts to keep overseas agents well-informed, happy, and selling hard.

One recent example comes from Canada. Several weeks ago, Noranda Copper & Brass Ltd., Montreal, invited agents (and their wives) from a dozen nations to come to Canada for a week of hospitality—plus inspection of mines and mills, and discussions of business problems. Noranda's aim: to stimulate cross-communication among foreign representatives; to show them new products, and new uses of Noranda copper mill products; to encourage them about copper's marketing possibilities—at a time when many copper industry men are gloomy.

● TRAFFIC DEPARTMENTS are gaining in importance. Traffic managers are being consulted more and more on the purchase of warehouses, materials handling equipment, protective packaging, and shipping forms.

In a survey of companies with large transportation expenses, Indiana University (U. S. A.) researchers found that the traffic department exercises considerable control over the preparation and timing of export-import freight shipments, of routes, and packaging material. And in 10% of the companies, the traffic manager does the actual purchasing of shipping containers and packaging materials.

● INGENUITY AND INVENTIVENESS of the Swedish packaging industry is one reason Sweden has the highest number of self-service stores per capita in the world—350 per million people—according to *The Paper Industry*. Among recent accomplishments are new air- and moisture-proof packaging for bread and vacuum packaging for skinless frankfurters.

Sweden's frozen-food industry is the most advanced in Europe, *Food Engineering* reports. Widespread promotion is done by the Swedish Bureau for Frozen Foods and the Home Research Institute.

Allied Chemical

DIVISIONS:

- BARRETT
- GENERAL CHEMICAL
- NATIONAL ANILINE
- NITROGEN
- SEMET-SOLVAY
- SOLVAY PROCESS
- INTERNATIONAL

Chemicals for Breakfast?

At breakfast—and all through the day—chemicals serve you in the form of easily molded, colorful, economical plastic products.

Beautiful and virtually indestructible tabletops, chair seats and plastic wall panels are made from Allied Chemical's "PLASKON" polyester resins. And Allied's "PLASKON" melamines are used in plastic dinnerware.

Allied's "PLASKON" Urea molding compounds make better radio and television cabinets . . . with more than 12,000 colors to choose from!

Weather, stain and heat resistance . . . permanent color brightness . . . washability . . . lightweight strength . . . these are some of the attributes of Allied Chemical's wide range of "PLASKON" plastics and resins for today's modern living.

For information about Allied Chemical and its products, companies should send for our new, illustrated booklet, "Introducing Allied Chemical International". Write: Allied Chemical International, Room 203A, 40 Rector St., N. Y. 6, N. Y. Cable: ALCHEMIC, NEWYORK.

PLASKON is a trademark of Allied Chemical & Dye Corporation

ALLIED CHEMICAL

your most dependable source of quality chemicals

Allied Chemical offers plastics manufacturers a complete line of resins, pigments and intermediates

In plastics, the manufacturer who can select from a wide range of chemical raw materials adds flexibility to his equipment and to his products. Allied Chemical offers such a selection—a complete line of resins, pigments and intermediates, backed up by advanced research and technical development facilities. Among the quality products made by Allied Chemical are:

"A-C" Polyethylene:
a low molecular weight polymer for coating, molding, rubber and wax formulations.

"PLASKON" Molding Compounds:
ureas, melamines, alkyds, nylons and other molding and coating resins.

Phenol

Formaldehyde

"NACCONATE" Isocyanates

"NATIONAL" Dyes and Pigments

Plasticizers

Antiskinning Agents

Acids

Ethanolamines

Glycols

Processing Chemicals

Phthalic Anhydride

Maleic Anhydride

"CUMAR" Resins

Allied Chemical

From the broad research and production facilities of Allied come the basic chemicals of world industry. These are the six Allied Chemical divisions and the products they make:

BARRETT: Coal-tar chemicals, building materials; "PLASKON" resins and plastics.

GENERAL CHEMICAL: Basic heavy chemicals; "BAKER & ADAMSON" Laboratory Reagents, agricultural chemicals; and "GENETRON" refrigerant and propellant gases.

NATIONAL ANILINE: Dyes, certified food colors, intermediates; "CAPROLAN"—the new concept in nylon—and "NACCONATE" isocyanates for urethane foams.

NITROGEN: One of the world's foremost producers of nitrogen products, including ammonia, urea, sodium nitrate and "ARCADIAN" fertilizers as well as petrochemicals, such as ethylene glycol, ethanolamines and methanol.

SEMET-SOLVAY: First in merchant coke production, supplies "A-C" Polyethylene for coatings and waxes, builds "WILPUTTE" by-product coke ovens.

SOLVAY PROCESS: Leader in alkali production, also chloromethanes, hydrogen peroxide and aluminum chloride. Supplies "MUTUAL" chrome chemicals and "KOREON" for leather tanning.

ALLIED CHEMICAL INTERNATIONAL: Sells and services all of these products to overseas customers throughout the world.

The capitalized names in quotes are trademarks of Allied Chemical & Dye Corporation.

▶ FINANCIAL DIGEST

The flow of foreign capital to Canada is well on the way to a new record this year.

As usual, the next-door Americans lead the parade (page 11). But note the increasing investment from across the Atlantic. Canadian opportunity presents a powerful lure.

Net sales of Canadian securities to British investors for the first six months (at $72-million Canadian) were not much less than the total-for all of 1956. Add that to the growing direct investment—in British-controlled enterprises—and you have a total U.K. stake in Canada of around $3,000-million. Meanwhile, continental investors—Germans, Swiss, Belgians especially—are building up both portfolio and direct holdings.

Not all the direct investment in production facilities is being made by big companies. A growing number of "small businessmen" are setting up shop in Canada, too.

Canadians welcome them, but urge that they make careful studies of the size and structure of the Canadian market first. Some have not—and wish they had.

There is plenty of free advice available. Canadian Trade Commissioners are on hand in most capitals. Some of the provincial governments, even cities, have men abroad actually wooing foreign manufacturing investment. And the leading Canadian banks are ever anxious to help through their offices overseas.

●

Do gambles on inflation pay off? So far, this one has:

Three years ago Producing Properties Inc., a U.S. oil company, set up a $10-million capital fund to buy proven oil and gas reserves. To date $7-million has been invested—and PPI expects an eventual return of $6 on each $1 invested.

"Our large oil acquisitions are an exploitation of what we see as a long-term inflationary trend in the U.S. economy," PPI's President Robert J. Bradley told *Petroleum Week*.

To conserve capital, PPI finances its purchases through "production-payment" loans: Its bank gets a percentage of output instead of cash payments. PPI expects an annual income—after production payments—from each property equal to the capital invested.

Only one deal in 50 goes through. PPI spends about $18,000 a month (roughly 4½% of its income) on appraising prospective purchases. The company has its own staff of eight engineers, an accountant, and a tax lawyer.

●

U.S.A.'s General Mills Inc. now offers its salaried employees a retirement-income plan based partly on variable income from a common-stock fund.

Employee's contribution is based on salary; then the company adds almost twice as much. Half of the total goes into the common-stock fund (managed by a trustee); the other half goes into a fixed income annuity.

FACTORY IN HOLLAND INCREASES PRODUCTION

. . . Saves on labor

MODERNIZES MATERIAL HANDLING METHODS WITH FIVE TRACTOMOTIVE TRACTO-LOADERS

● TWO MODEL TL-10's — each with a 0.76m³ (1-cu yd) Tip-Back Bucket

● TWO MODEL TL-6's — each with a 0.38m³ (½-cu yd) Tip-Back Bucket

● ONE MODEL TL-6 with a lift fork — interchangeable with bucket. Ideal for unpaved ground.

In August, 1955, two Tracto-Loaders went to work for Clay Works Russel-Tiglia Ltd., Tegelen, Holland . . . proved their cost-cutting ability so well three more were added. Now five Tracto-Loaders are used instead of hand labor and side-tip cars to stockpile and transport clay.

The Tracto-Loaders have enabled this progressive factory to transfer 16 men to other work. Output in the clay-preparing section has already increased about 25 percent . . . with the loaders only working at partial capacity.

Let your ALLIS-CHALMERS CONSTRUCTION MACHINERY DEALER show you how modern Tracto-Loaders can modernize your material handling and excavating-loading work. Five Models — 0.38m³ (½-cu yd) to 1.53m³ (2-cu yd) capacity.

TRACTOMOTIVE
TRACTOMOTIVE CORPORATION
Export Dept. MD, Deerfield, Ill., U.S.A.

- World sugar men seek greater returns from by-products, which in the past have contributed little to the industry's income.
- Sugar itself is finding new applications—in everything from shampoo to milady's blouse.
- The trend promises healthy diversifications for sugar producers, new opportunities for business.

Sugar Turns toward Research

DURING THE PAST YEAR the world price of sugar, propelled by the Middle East crisis and low inventories, went for a wild ride upward, from 3.25¢ per pound to 6.50¢. Eventually, as it had in the past, the price tobogganed down to earlier levels again.

Such has been the history of sugar in the past 100 years. Sudden scarcities, soaring prices, expansion of plant facilities; then mounting surpluses, low prices, curtailment; fortunes made and fortunes lost. These abrupt reversals have been cruel to the economies of Cuba, the Philippines, and the many other countries who rely heavily on the industry.

Thinking men in sugar-producing areas know that there is only one cure to this recurring panic. The industry must broaden its base by diversifying its product. Chemists and technologists recently have advanced two broad lines of action for accomplishing this:

—**further utilization of by-products,**

—**industrial use of sugar itself.**

Research along these lines is proceeding rapidly. Already industrial managers and investors—as well as agriculturalists—are studying many important new opportunities offered by sugar.

Molasses, a by-product of both cane and beet sugar processing, already contributes substantially to the income of sugar companies. Much of it went into making alcohol during the war. Now, with ethylene taking its place for this purpose, the animal feed industry buys most of its output. Molasses is an appetizing and nutritious product, and current research is directed toward standardizing its sugar and mineral content and combining it with other ingredients as a high-value feed.

When juice is extracted from sugar beets, the waste product is beet pulp. Local farmers feed this to their cattle and, though it has a strong taste, the animals thrive on it.

Latest research in this field is directed toward tripling the protein value of beet pulp by the addition of ammonia. Experimenters at Britain's Institute for Research in Dairying have drafted ten sets of identical twin calves for this purpose. One set gets ammoniated beet pulp, and the other a highly nutritious and expensive peanut meal. Both have been putting on weight at the same rate.

This means more beef and milk for the British table. Many countries lack protein-value feedstuff. To get such feed, European cattle raisers import copra meal from as far away as the Philippines. But beet pulp is abundant throughout Europe, and Europeans invented the process for synthesizing ammonia.

Researchers also have been investigating ways and means of getting greater value out of the comparable by-product of the cane sugar industry, the fibrous waste material known as bagasse. Until recently most bagasse went into the sugar factory's own furnace as fuel, and the excess was burned in the fields. Today it is being converted into paper, chemicals, poultry litter, insulating board. Soon it will be made into hard board.

Making paper from bagasse has passed from research into commercial development, though studies continue on the several processes available. W. R. Grace & Co.'s 18-year-old bagasse paper factory at Paramonga, Peru, is being enlarged and converted to a new continuous process said to turn bagasse into fine-grade pulp in a matter of minutes. The Valentine factory in Louisiana, U. S. A., produces 75 tons of bleached bagasse paper a day. Other

MOLASSES, here sprayed on grass, is upgraded into a high-quality feed.

plants are in operation in such cane-rich countries as Brazil, Taiwan, India, and the Philippines; meanwhile large factories are blueprinted for Cuba and Puerto Rico.

A unique use for bagasse came into being about three years ago in the Dominican Republic. The Central Romana By-Products Co. turns bagasse from a neighboring sugar mill into furfural, an organic compound in demand by oil refiners and chemical companies. Chemists use furfural as an intermediate in the manufacture of nylon.

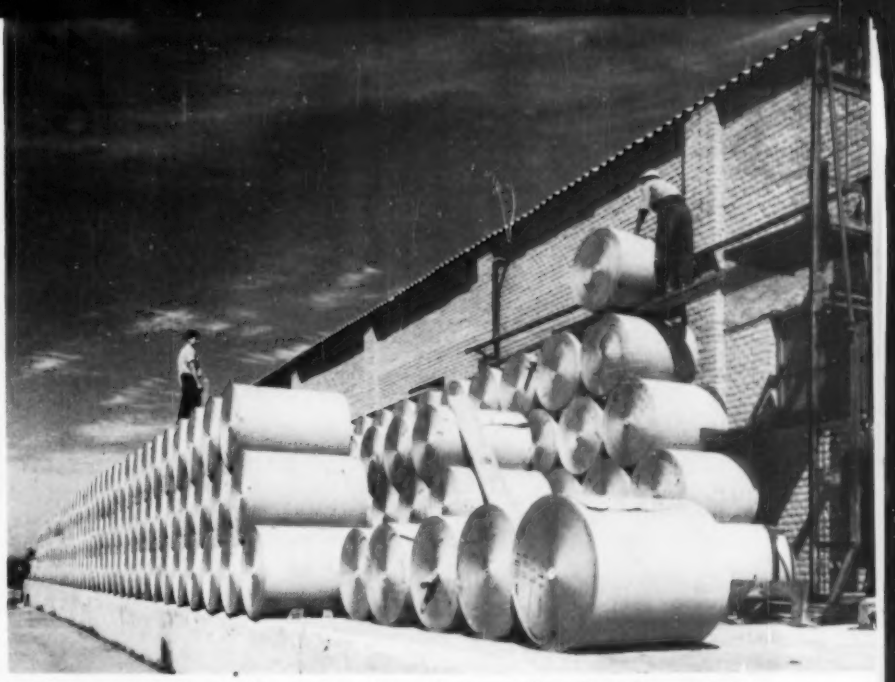
You will soon see in Cuba a significant example of how by-product development can bolster a nation's economy. Shortly after the first of the year Cia. Cubana Primadera will begin producing hard board and other construction materials from bagasse. Lumber is scarce and expensive in Cuba, but bales of surplus bagasse decorate the landscape from one end of the island to the other.

Promoters of the project, The Francisco Sugar Co., hired a top engineer to find two answers for them: 1) Can quality hard board be made from bagasse? 2) Can a plant be designed to offer a variety of end products? Research and pilot-plant work provided affirmative answers to both questions.

The Primadera development owes much to a new process which efficiently separates bagasse into its two basic parts, fiber and pith. Only fiber is needed in making paper or board.

Bagasse fiber at the new factory will first be formed into soft board suitable for insulation. Some of this will be further processed under controlled heat and pressure into either medium-density board —for special furniture requirements—or into hard board, said to be 15% to 45% stronger than a comparable product made from wood.

Hard board has an almost endless variety of uses, all of them important to Cuba and its neighbors, where most of the board will be marketed. In the building trade, it is used as flooring, subflooring, shingles, for doors and paneling. Further processing at Primadera can convert the board into simulated tile, counter tops, and products resembling grain wood and marble.



PAPER BAGASSE provides cartons, bags, for expanding Peruvian markets.

Research also has led to plans for using sugar itself as a base for the manufacture of plastics, detergents, paints, insecticides, and other useful chemicals. Much of the exploratory work has been sponsored by Sugar Research Foundation, Inc. in New York, a group founded by U. S. sugar companies but now financially backed by firms on every continent.

"Coal and petroleum reserves, which now form the basis of most synthetic organic chemistry, will some day be depleted," says Dr. Henry B. Hass, Foundation president. "And we shall be forced to depend more upon sugar and the substances which plants make from sugar."

He points out that sugar compares favorably in price with alternative raw materials. It is available throughout the world.

Such cost factors underline the recent announcement by one of the Foundation's research groups of a new family of thermosetting resins using as much as 50% white sugar, plus phenol and formaldehyde. The new resins are about as strong as straight phenol-formaldehyde products and 25% cheaper. In uses where color is not a factor, raw sugar can be used and the savings are far greater.

The most publicized project of sucrochemistry is the synthesizing of detergents from sugar and fats (MD, Dec. 1955, p 22). With fats

SUGAR SHAMPOO, an experimental detergent, is odorless and non-toxic.

NYLON blouse makes use of furfural —based on sugar cane waste.

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as well as sugar plentiful in most areas of the world—and detergents scarce and expensive—this process has captured the imagination of many businessmen. Licenses for use of Foundation patents have been issued to four firms in Europe, three in Latin America, and another three in the U. S. A. Three pilot plants already have begun making the new material for test purposes. One of these, the Berkeley Chemical Corp., U. S. A., is manufacturing and marketing limited quantities of sugar detergents.

By-product development and use of sugar as a raw material walk hand in hand toward one goal: diversification of the output of sugar areas, leading to less reliance on the "ups and downs" of one crop. Combined with this is the obvious result of making new products available in new areas. Cuba will have hard board, Brazil and Mexico more needed paper and paper products, sugar beet countries like Denmark and France a broader base for their chemical industries. ●

Isotope Tubes Aid Precision Gaging

Krypton 84 atomic isotope tubes are being used at the Eli Whitney Metrology Laboratory, U.S.A., to provide super-accurate light sources for measuring dimensions to fractions of millionths of a centimeter. The tubes were especially developed by West Germany's Bureau of Standards, the Physikalisch-Technische Bundesanstalt, for use of the laboratory, operated by the Sheffield Corp.

Sheffield, a manufacturer of measuring instruments, has been working with the U. S. Bureau of Standards in a research program aimed at measurements to a tenth of a millionth of a centimeter. The company's laboratory has used the Mercury 198 Isotope for some time in refining and sharpening the visibility and measurement of light waves. Many scientists believe that atomically created light waves can eventually be adopted as the world's primary standard of length, succeeding the wave length of red cadmium light. ●

Electronic instruments have moved into the laboratory—offering new accuracy and reliability to the production plant. Among them are the portable mass spectrometer, in foreground of picture left, and the mobile laboratory above.

Automation Invades the Test Station

Digested from CHEMICAL ENGINEERING, Sept, p160; BUSINESS WEEK, June 29, p173; Aug31, p62

TWO-WAY TRAFFIC now moves busily between the production floor and the laboratory. It has all happened during the past ten years: Operating men began usurping instruments from the testing station in search of greater accuracy, reliability, and quality control. Now chemists borrow just as liberally from the process stream, in a bid for equipment that saves time and money and offers automatic recording and control.

The laboratory where men in white ruled with pipette and test tube now houses such versatile and complex tools as the emission spectrometer, the differential refractometer, mass spectrometer and vapor fractometer. Instrument engineers see the day when all operations in the laboratory—sampling, analysis, and recording—will be automatic.

A British instrument firm operates such a laboratory. Electromagnetically controlled valves admit samples and reagents, while control units determine the sequence and durations of the tests. An American firm, Sun Oil Co., uses a mobile laboratory equipped with gas chromatograph, data logger and computer. The truck pulls up to refineries and plugs into process lines to make tests and help solve operating problems.

Use of automated laboratory tools can substitute technicians for chemists, freeing such highly trained men for more exacting duties. At the testing station of a large metals factory a technician can test alloy samples by feeding them into an emission spectrometer. Dials begin to spin, and in three minutes he has a quantitative analysis of the material, details of as many as 18 elements with an accuracy to within one part to 10,000.

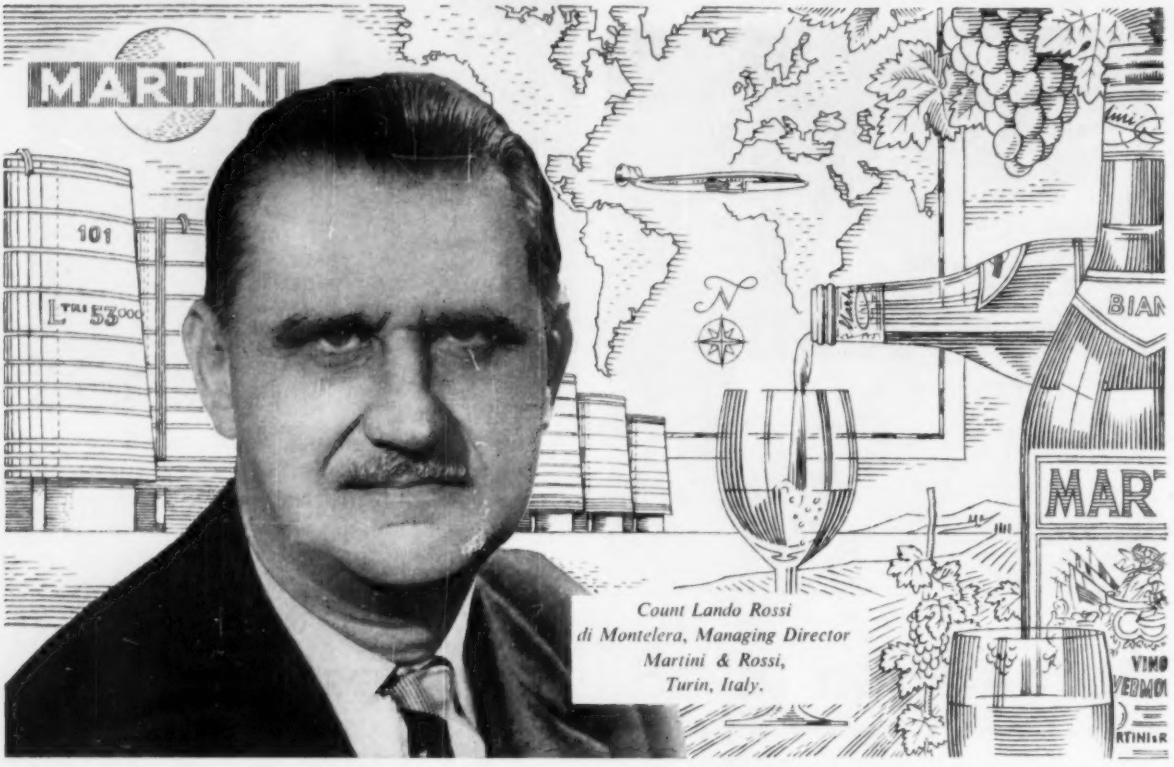
A similar instrument installed at a chemical plant permits a single chemist in one hour to do what five chemists used to do in four hours.

Another trend in the control laboratory has been the substitution of micro and semimicro techniques for macroanalysis. The components and molecular weight of many substances can now be determined accurately from a few milligrams of a sample. Micro methods take up less laboratory space, cut down on analysis time, and can provide greater safety when working with hazardous materials.

Use of complex process instruments in the laboratory has been possible through the development of smaller, less expensive models. The mass spectrometer in the picture above is a case in point. The first industrial version was built in 1938 at a cost of $250,000 for use in oil prospecting.

Laboratories now can buy a portable model for $5,300. The versatile unit moves easily from the laboratory into any location in the factory, and in 15 to 30 minutes can analyze the kinds and amounts of gaseous elements in a mixture. Its low cost and mobility make it applicable to analyses that were not feasible for small manufacturers in the past.

How automatic instruments win acceptance in control laboratories is seen in the history of the vapor fractometer, a relatively new analytical tool. This machine separates and tabulates the proportions of hydrocarbon chemical mixtures. A few years ago, analyzing a mixture of butadiene, propane, butane, and propylene would have been a



Count Lando Rossi di Montelera, Managing Director Martini & Rossi, Turin, Italy.

Grapes, herbs, and years of sober thought...

Count Lando Rossi has many friends. But not as many as the familiar bottle of vermouth that bears his name. Its worldwide popularity has been won not in one lifetime, but through the ceaseless efforts of three generations of Counts Rossi. Martini Vermouth is born in Italy. Carefully processed grapes are blended at a certain stage with rare herbs. Which herbs and how will always remain a secret. Down from Grandfather Luigi, son and son of son have inherited the formula. The world has changed since Grandfather Luigi first coaxed his elixir from the grape. There are modern methods to make all things. Vermouth, as well. Human feet have been replaced by electrical presses, dusty vaults by airconditioned chambers. But some things science can not improve. The delicate taste of a martini, for example. Today, four Rossi cousins share the secret. And the burdens of management. They take turns as President. This year it is Count Lando's turn. A bachelor, the Count delights in the exact, the scientific. Also in the rare and the beautiful. He has filled his mansion with heirlooms, precious ivory and antique clocks. His wise, deep-set eyes have seen treasures in many lands, as he follows the wide travels of his famous product. The Count values tradition. He sees it in KLM. "KLM has its own secret formula for hospitality and service," he explains. "As a result, a trip by KLM is as promising as a well-mixed martini. And as satisfying."

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terrible headache to a chemist. Now, thanks to the vapor fractometer, it's a five minute job.

When Perkin-Elmer Corp. (U. S. A.) brought out its first commercial model of this instrument in 1955, the company's engineers estimated that 200 instruments would saturate the market. Within a few months, large laboratories and chemical firms began clamoring for the time-saving machine. Today, there are more than 1,500 in use.

Type of analyzing and recording units depends on the samples to be analyzed. Atomic energy researchers at Harwell, England, use an automated laboratory to test uranium liquors. Equipment draws measured samples automatically from four different sources, adds two reagents to each sample, sends the mixture to an absorptiometer, compares color intensity against a known standard and records the results.

Modern analytical instruments usually are created either by academic laboratories or the instrument staffs of process industries. The vapor fractometer originated in England. Several American companies designed their own low-cost versions.

Automatic instruments are still too costly for many laboratory uses. But manufacturers have their eye on the needs of the small and medium-sized testing stations. Each year new low-cost models of research equipment become available. Eventually automation will take over the control laboratory, as it has done on various production lines, and the result will be faster service, reliability, greater savings. ●

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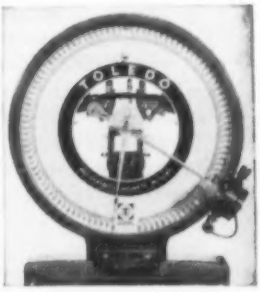

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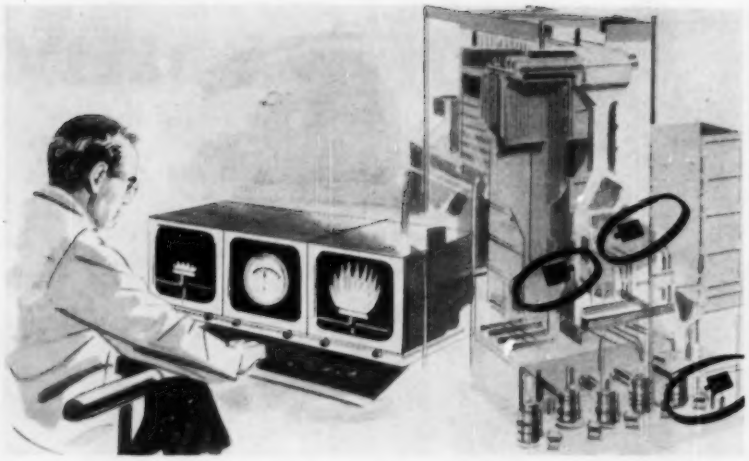


TELEVISION CAMERAS inspect boiler flames and gages . . .

. . . record an auto's spring action . . .

ITV: Less Novel, More Useful to

First publicized as a novelty, closed-circuit television has become a reliable aid to manufacturers.

MAKING NITROGLYCERINE is a treacherous business. Accidents and casualties occur, despite the ingenious precautions of management. Imperial Chemical Industries Ltd., England, has walked away from the danger, literally: A camera now watches dials and liquid levels, while an operator in another building safely follows the action on a television screen.

Industrial television (ITV) has taken over for the human eye in testing jet engines, making steel, and in handling radioactive chemicals. British and American physicists use it for atomic energy research.

In scores of other applications ITV helps improve product quality, cuts labor costs, guards against crime, and speeds production and transportation.

To what extent has TV become a practical tool for industry? Is it economical for the ordinary factory or store?

Advanced publicity for ITV confused some of the thinking about its prospects. Unusual (but not always practical) uses got the first headlines. But the variety of applications supports the view that ITV has a broad future. Major fields of use are remote viewing of inaccessible gages and operations; as a production tool for delicate jobs; guarding plants and stores; and for data transmission and traffic control.

Inaccessible Operations: Several American public utilities have put television to work at watching gages and boiler flames, as shown in the large drawing. At a plant of the Toledo Edison Co., a camera now sets near a boiler gage eight stories from the ground. Operators used to have to climb the stairs periodically to check the water level.

In other remote viewing uses, cameras are lowered inside drill pipes for oil well inspection; aircraft companies employ others for watching jet engines blow themselves to pieces in overspeeding tests; and General Motors Corp. mounts one under test cars to observe the action of springs.

Television also offers distance observation to medicine and education. Surgeons and medical students all over the world are beginning to watch operations on TV.

A Production Tool: An equally important use has been as a guide to delicate machining jobs. Projected on a large screen, the TV image helps an operator line up his work in a tool. At the Detroit slabbing mill of the Great Lakes Steel Corp., a television setup assists the shearman in making an accurate cut by giving him an enlarged view of the slab and a calibrated scale.

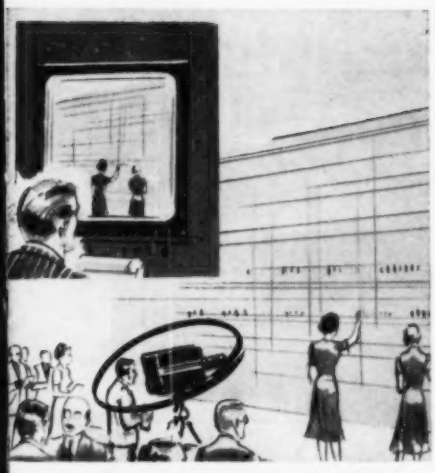
Eyes of the Police: Perhaps the most glamorous of ITV applications has been its role in guarding factories, stores and warehouses. A guard can watch and electrically open all gates at an industrial plant from his position in front of a set of TV screens (MD, Oct., p 33).

Closed-circuit TV stands guard over many U.S. warehouses and stores, acting as a deterrent to pilferage and shoplifting. Its advocates claim that such surveillance cuts down losses by 50%. Gimbels of New York recently joined the dozen or more department stores which find it valuable.

Transmitting Data: Bank tellers now use TV to check signatures and customers' balances. A New York stockbroker flashes quotations by TV from the main office to its branches, finding it faster than ticker service.

At New York's Pennsylvania Station an array of 105 cameras and 103 monitors speeds the placing of train reservations and ticket sales. The ticket agent merely dials a combination, and the entire reservation board for the date and train appears on his monitor screen.

Traffic Regulation: Closed-circuit has been found valuable for controlling the movement of autos and freight cars. Railroads have become enthusiastic customers.



. . . and flash stock market quotations.

Business

Cameras are set up in freight yards to record and coordinate the movement of cars.

A new twin-tube highway tunnel in Pennsylvania, U. S. A., will use eight cameras to avoid long delays from auto mishaps. Each camera is equipped with a telephoto lens and will scan the traffic in 900 ft. of highway. An attendant, seated before eight monitor screens at a control station, can instantly send towing equipment where needed.

Industrial television equipment is of two basic types: Vidicon and image dissector. A Vidicon camera provides the best picture and can be used with normal lighting. Image dissector equipment has less sensitivity and requires added lighting.

Cameras sell anywhere from $500 to $10,000. If color or special equipment is required, they can go higher. Monitors can be had for about the same price as home TV receivers.

Constantly increasing applications have proved that ITV is no longer a toy or a novelty. Its future appears bright. Its value for a business depends on individual circumstances: what problems it will solve, how much labor and money it will save. ●

Digested from Technology, Sept, p259; Business Week, Sept 14, p106; Engineering News-Record, Sept 5, p27; Ingeniera Internacional Industria, Sept, p38.

Hard Yet Elastic Rubber Parts

Digested from PRODUCT ENGINEERING, Sept. 16, p68.

In selecting rubber materials, design engineers must choose between hardness and elasticity. Efforts to reconcile these two properties have been attempted by blending waxes, fillers, and reinforcing agents into the rubber. But they have not been completely successful.

An answer to this dilemma has come from Germany: cast urethane rubber. It is a series of synthetics arrived at by combining diisocyanates (also used in making foams) and polyesters. The two are mixed together in liquid form under precise conditions of temperature and time. The result is a prepolymer that can be cured at atmospheric pressure and cast in light and cheap molds.

Cast urethane parts today appear in almost every German automobile. They also serve as rugged but resilient components of motorbikes, farm tractors, typewriters, and floor waxers.

The material appeared commercially in Germany for the first time in 1950, from technology begun in 1938. Several American manufacturers recently have found great possibilities in the material. Improved techniques for casting urethane are being developed both in Europe and the U. S. A. resulting in the variety of end products shown in the pictures.

Cast urethane has better tensile strength and elongation properties than natural or Neoprene rubber. The material also has exceptional wearing characteristics.

Though not designed for chemical resistance, urethane synthetics absorb little water and have good oil resistance. They deteriorate, however, in dilute alkalis and acids.

Size poses no particular limitations in the use of urethane. Parts weighing up to 18 kilos have been cast. Shrinkage runs from about 1% to 2%. Intricate shapes containing projections, slots, and tapers offer no problem—the resin is poured water-thin.

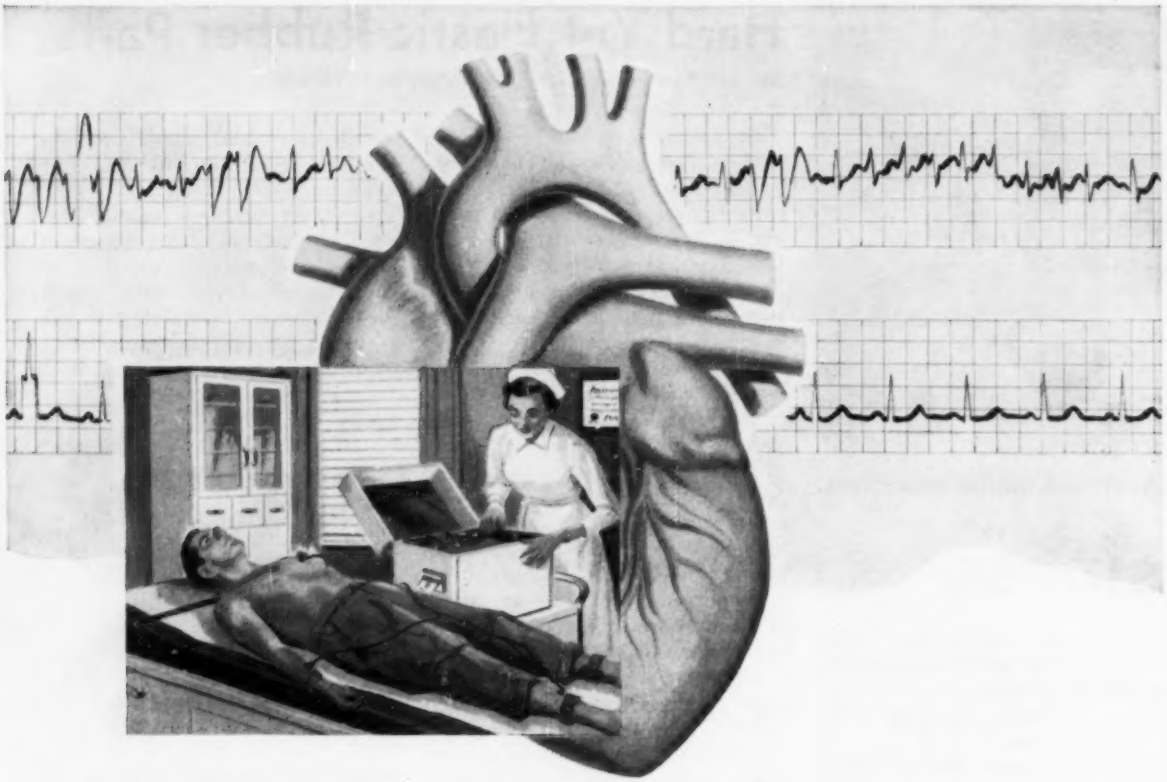
Adhesion of urethane rubber to metal is very good. Manufacturers make composite castings from metal-and-rubber, plastic-and-rubber, and from different grades of urethane rubber itself.

Gears of urethane rubber, for such products as waxers, kitchen mixers and motorcycles, are always mated against metal gears. Close tolerance machining is not required, for urethane's elasticity permits small misalignments. ●

VERSATILE material ends up in typewriters, gears, packing rings.

ABRASION resistance is required for sandblast nozzles, pump rotors.

INTRICATE shapes formed from material that starts as a thin liquid.



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TO THE UNTRAINED EYE, cryptic marks on a sheet of graph paper. But to the cardiologist, familiar with the "handwriting" of the heart, they can mean the difference between life and death.

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In Materials Handling: Imagination Pays Off

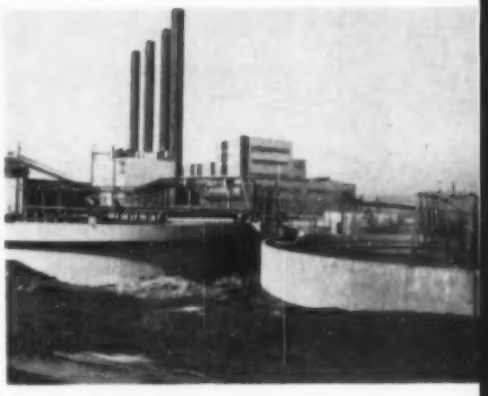
This is a first principle for managers in search of methods that reduce costs. Standard equipment put to novel uses feature the handling schemes in three diverse industries below.

ASSEMBLY PARTS — With space at a premium, a manufacturer of technical products found that production this year would be 50% higher than last. About 3,150 square meters of added floor space were required, but this space was unavailable. Output had to come from better use of existing space.

To move some 57,000 different parts from the stockroom to the assembly line General Electric Co.'s plant at Syracuse, N. Y., U. S. A., went to the overhead storage conveyor shown at right.

Aluminum boxes spaced about a half meter apart follow the girders around the shop suspended from a continuous track and chain conveyor. Bins of each box contain complete parts and sub-assemblies for the product being made. The conveyor dips down twice during its circuit of the shop, for loading in the stockroom and at the unloading station halfway around the track.

This moving storage system has released about 270 square meters of floor space to production. Other advantages: an even flow of materials to and from the assembly line; less handling of parts in the manufacturing area; yearly savings, $12,000. (*Factory Management and Maintenance, Sept, p* 136)



COAL — Search for cheaper means of transporting coal overland has led to a 170-kilometer pipeline that moves the product as slurry for Pittsburgh Consolidation Coal Co., Ohio, U. S. A.

Transport of solids for shorter distances has been done by pipe-line before. A ten-kilometer line in France moves coal from a coal cleaning plant to a steam plant.

The installation in Ohio consists of three sections: a preparation plant; pipe-line and pumping station; the dewatering terminal.

At the preparation plant (photo right) coal is crushed, screened and mixed with water. Pumps at three locations move the slurry the 170 kilometers through 27-cm welded steel pipe buried below ground to avoid freezing.

At its destination, the slurry is thickened by the removal of water, passed through drying columns, then discharged into a surge bin. A million and a half tons of coal per year can be moved through the line. (*Heating, Piping & Air Conditioning, Sept, p* 108)

PRODUCE — Convinced of the advantages of bulk handling, several American packers and canners recently have turned to shipping their produce from field to plant in wirebound pallet boxes. Pictured right is a bulk load of onions being fed mechanically into a hopper that serves a pre-packaging line. Similar sturdy boxes carry potatoes, green beans and citrus fruit.

Use of the pallet-box method sharply reduces labor requirements, product damage, and waste. One man with a lift truck replaces a crew of 10 to 20. The new system abolishes costly bags, hampers, and picking boxes. Pallet boxes are speedily discharged into hoppers feeding canning, freezing, and packaging lines.

Exterior cleat-type boxes carry loads of over a ton, and can last for over 100 trips. One vegetable grower has used the same set of pallet boxes for three years, and most of them still are in good shape. Loaded pallet boxes are stacked by lift truck four high. (*Food Engineering, Sept, p* 116)

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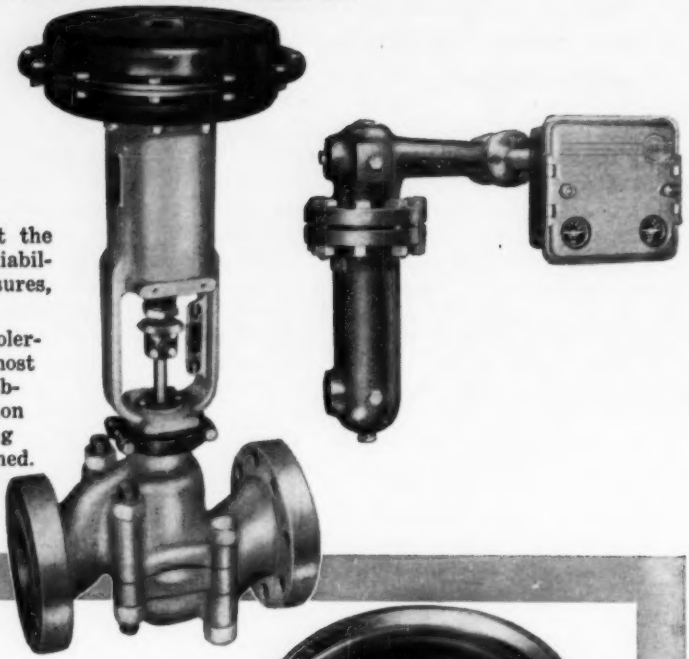

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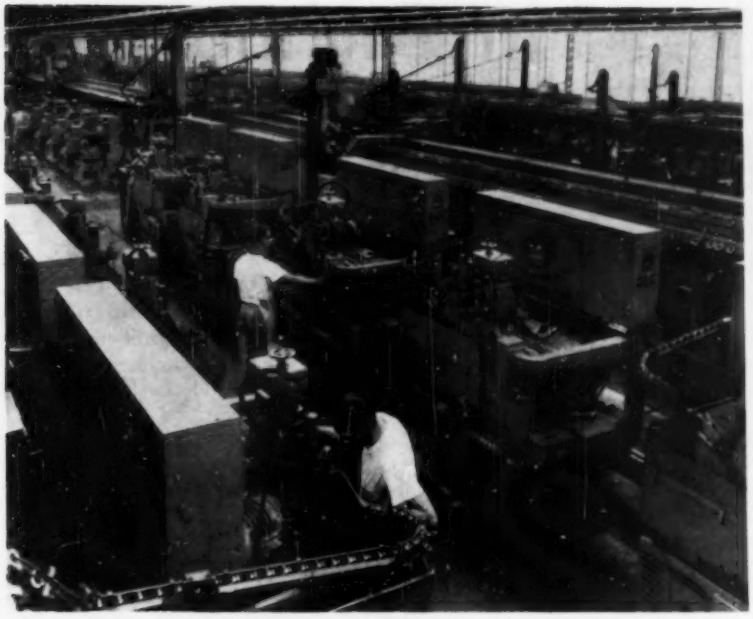

CONVEYORS, chutes and elevators connect different machine operations.

More Bearings for Less Money

Labor and material costs have soared to new highs in the past four years, but roller bearings for 1957 automobiles can cost less than those for 1953 models. Auto manufacturers—as well as others—pay less if they have standardized their applications, and can buy in bulk from highly-mechanized plants. The Timken Roller Bearing Company's new installation at Bucyrus, Ohio, U. S. A., is mechanization at its ultimate.

The plant is built around what Timken calls the "Bucyrus concept". It means selling customers the advantages of standardization, producing high quality bearings at unprecedented rates, and utilizing an integrated shipping center controlled by an electronic computer.

Timken engineers do not use the word automation nor do they compare their degree of mechanization with the recently publicized bearing factory in Russia (MD, March, p46). They stress the efficiency of the machines developed for use at Bucyrus, the uninterrupted flow of bearings and the precautions taken against breakdowns.

The $12.5 million Timken plant can produce 33 million cups and 27 million cones a year. Parts move on a straight line from one machine to the next by conveyor or chute. No operator touches the bearing as it moves from stock storage to machining, carburizing, grinding, honing, and on to automatic gaging. Under a system previously used, bearing cups received 89 separate handlings.

The plant can produce 34 different cup sizes, but 14 cups and cones account for 80% of production. Keeping customers' orders within these standard sizes means fewer line changes, less retooling and decreased handling costs.

A few hundred meters away from the production plant is the Bucyrus Shipping Center, a highly mechanized warehouse handling bearings from all of Timken's U. S. A. factories. With its 12,600 square meters of floor space, the building houses 12 to 15 million bearing parts, equivalent to a month's requirements.

Parts move about the warehouse on an intricate system of conveyors, lift trucks and special equipment. Controlling the movement of goods, in line with production and order schedules, is an IBM 650 computer located at the company's Canton offices 90 miles away. Information stored in the computer includes balances of pieces on order, inventories, pieces scheduled for production. ●

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MANAGEMENT DIGEST invites other consultants to list the special services they offer on these pages.

Looking Ahead in Technology

● **ELECTRICITY made from hydrogen and oxygen soon may power small automobiles, lawn mowers and outboard motors.** The prototype for such generators is the fuel cell shown above, developed by the National Carbon Co. for operating a mobile radar set of the U. S. Army's Signal Corps. This is the first practical device for converting chemical energy into kilowatt quantities of electricity.

The gases enter two hollow, porous carbon electrodes immersed in an electrolyte solution of potassium hydroxide. The hydrogen diffuses through the negative electrode, releasing electrons that flow to the oxygen electrode and create an electric current.

Unlike a storage battery, the cell's electrolyte is not depleted by normal operation. What is consumed is the hydrogen and oxygen. The unit has no moving parts, operates at normal temperatures, and is virtually maintenance-free. With no fixed storage capacity, the cell can furnish electrical power on demand as long as fuel is supplied. (*Business Week, Sept*21, *p* 81)

● **ARTICLES made from soft steel normally are fabricated first and painted later, a costly process.** Scientists of the British Iron and Steel Research Association now have worked out an advanced process for putting an organic coating on steel. Known as "Plasteel," the process bonds a thin film of plastic to the metal; the end product can be deep-drawn, roller formed, sharply bent and punched. Similar laminates are made in the U. S. A. for television cabinets and other furniture, but the British product is said to have better bonding qualities at high temperatures. Articles made from Plasteel stand up to abrasion, weather and corrosion better than enameled products. (*Technology, Sept, p* 258)

● **ION EXCHANGE, commonly used for high purification of water, has been put to work by the California wine industry.** The firm of Wente Bros. use it for stabilizing wine, in order to avoid tartrate precipitation after bottling. The conventional way is to chill the wine to −4 C. Use of ion exchange eliminates the capital and operating costs for refrigeration. (*Chemical Engineering, Sept, p* 144)

● **RESEARCH CHEMISTS have turned to natural and synthetic attractants as a means of more effective control of agricultural pests.** One is being used by governmental authorities in a plan to eradicate the gypsy moth from extensive forest land in northeast U. S. A. The attractant is prepared from female gypsy moths. It lures male moths to baited traps from distances of almost a kilometer.

● **THE PLANE shown landing aboard the U. S. Navy's carrier Antietam is using no pilot at the moment.** He sits in the cabin with his hands in his lap, as an automatic landing system developed by Bell Aircraft Corp brings the plane down to the ship. Radar has determined the plane's altitude and position in relation to the carrier's deck; a computer sends course corrections to an autopilot in the plane and then brings the aircraft down to its landing. The system being tested by the Navy must set the plane down within eight or nine meters of a predetermined spot on deck. (*Aviation Week, Aug*26, *p* 34)

● **CATTLE AND SHEEP today get the same attention to their diets as human beings.** Workers at the agricultural research center of Chas. Pfizer & Co., U. S. A., for several years have been feeding animals antibiotics and other chemicals and watching them put on added weight. Tranquilizers now are being recommended by Pfizer and other drug firms, and the advisability of its commercial use in animal feed is being studied by the U. S. Food and Drug Administration.

Animals fed tranquilizers eat more food in a given time, according to some authorities, and seem to convert it into body tissue at a faster rate. Its effect is said to be additive to other growth stimulants, such as stilbestrol and antibiotics; tranquilizers are believed to increase growth over and above improvements resulting from these materials. (*Chemical Week, Aug*31, *p* 44)

● **OIL COMPANIES and nonprofit research groups today are investigating ways of producing nonflam-**

mable fuels for airplanes. Such fuels would reduce the toll of lives lost in airplane crashes. Two lines of inquiry are being pursued by chemists: one hope is the development of a fire inhibitor that could be added to conventional fuels but be eliminated under engine operating conditions; the second would be the use of two inert fluids that combine in the engine to produce power. (*Chemical Week, Sept*21, *p* 49)

● **GOLD PLATING without electrodes is offered in the new**

"Atomex" process developed by Baker & Co., U. S. A. The process deposits 24-carat gold on copper, steel and other metal by ionic displacement. The base metal sheds its atoms into the plating bath and picks up gold from the bath. Baker claims that the bond between base metal and coating is firmer than by other methods. (*Product Engineering, Sept*9, p 5)

● **THE BRITISH WOOL INDUSTRY soon may be able to reduce shrinkage of their product by use of plastics in manufacturing.** The new process involves addition of polyamide and epoxy resins to wool fibers. The needed resins are inexpensive, and the technique does not hurt the quality and strength of the wool. Successful tests have been made on stockings, sweaters, flannel and jersey goods.

● **CHRYSOTILE fiber mined in Venezuela will be used as asbestos material in U. S. electrical and refrigeration equipment, machine parts and instrument cases.** World

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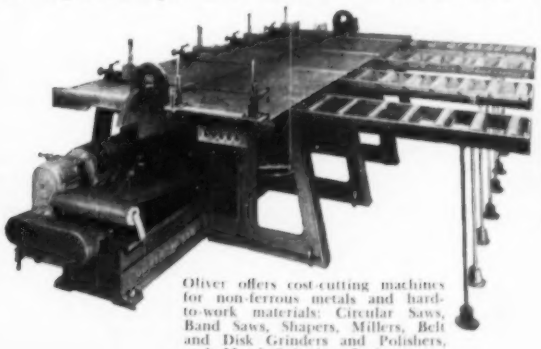

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BRANCH OFFICES THROUGHOUT THE WORLD

Commerce Corporation, S. A., will market a product specifically prepared for this purpose. It will be free of impurities and have a neutral pH. It will be formulated with aluminum silicate, calcium carbonate and other inert fillers to increase body and reduce costs. (*Product Engineering, Sept23, p* 15)

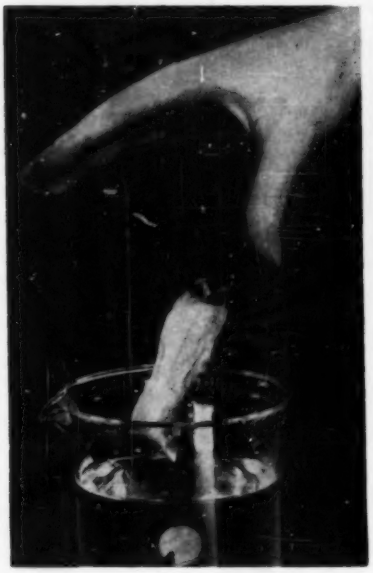
● **A LIGNITE-MINING METHOD developed by the U. S. Bureau of mines may soon be used to provide a fuel for generating low cost power in South India.** Experiments indicate that raw lignite from a large deposit in South Arcot, state of Madras, can be upgraded to produce superior fuels. Pilot scale tests will be conducted in Madras, employing a replica of equipment used in the U. S. A.

● **SAWDUST is an effective absorbent for decontaminating radioactive water.** The Study Center for the Application of Nuclear Energy (Mol, Belgium) says sawdust is expected to simplify handling and reduce disposal costs of radioactive wastes.

● **THE STEERABLE RADIO-TELESCOPE** shown above—the world's largest—was built at Jodrell Bank, England, at a cost of close to £1,000,000. To control and position the 2,000-ton structure, British engineers designed a unique computing-control servo system. The heart of the system is a Dunford & Elliot electromechanical analog computer that solves 14 trigonometric equations from inputs of sidereal time and astronomical coordinates, and then sends signals to the main driving system.

The giant telescope will be used by scientists of the University of Manchester for radio-astronomy research. An initial job will be to

locate the sources of radio emission 200 million light years back. (*Control Engineering, Sept, p* 32)

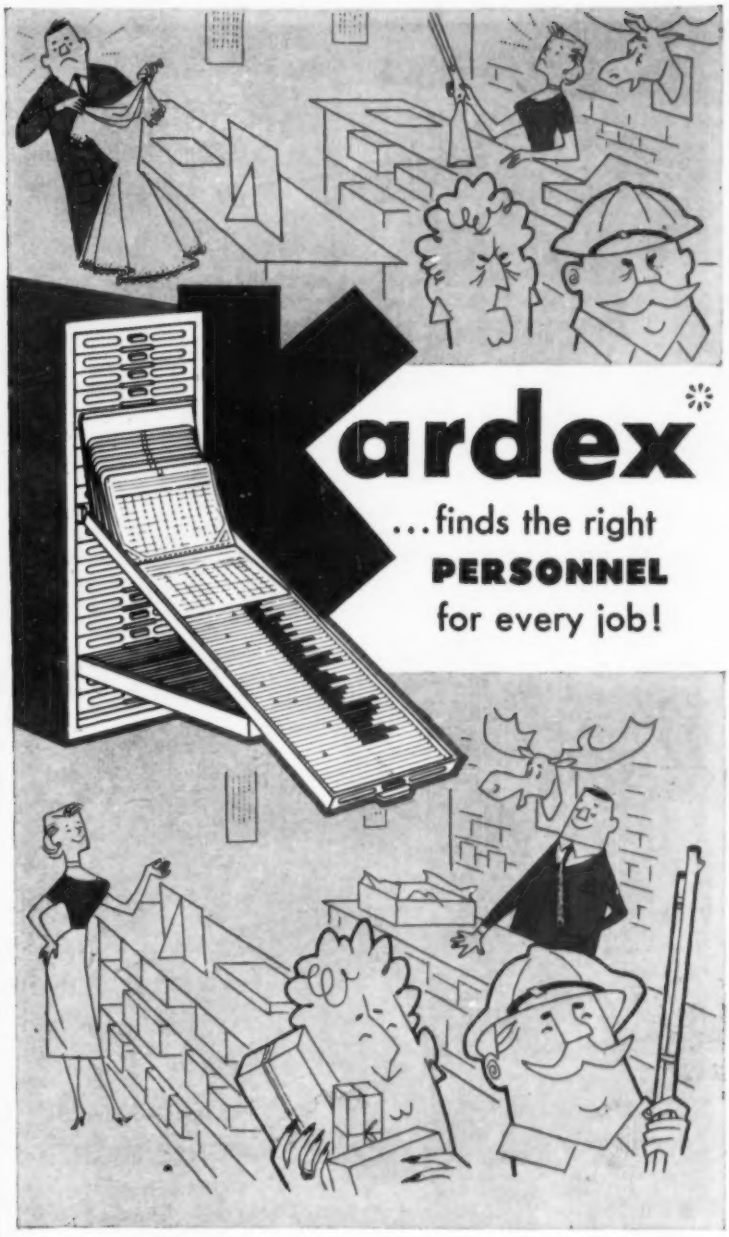


● **A PACKAGING MATERIAL that does not have to be removed will make its commercial debut on the U. S. market by the end of year.** The package will contain household dyes. A housewife will not have to open the packet but will merely drop it into water, as shown in the above photo, releasing the dyestuff as the covering dissolves.

The packaged dyes, which are marketed by Monroe Chemical Co, use polyvinyl alcohol packaging film made by Mono-Sol Corp. The film is said to be completely stable under conditions of high humidity, and to have an almost indefinite shelf life.

Mono-Sol chemists anticipate wide use of water-soluble packages in the future. Among the possible products that might benefit from such packaging are insecticides, preweighed medicinals, fertilizers and paints. The possibility of soluble packages of food also is being considered. (*Chemical Week, Sept*14, *p* 34)

● **FLUORIDATED drinking water for sheep?** Australian farm experts report that the fluoride-treated water is very helpful in improving the condition of the animal's teeth. Why the concern? Sheep with sore teeth will not eat, cannot produce good wool.



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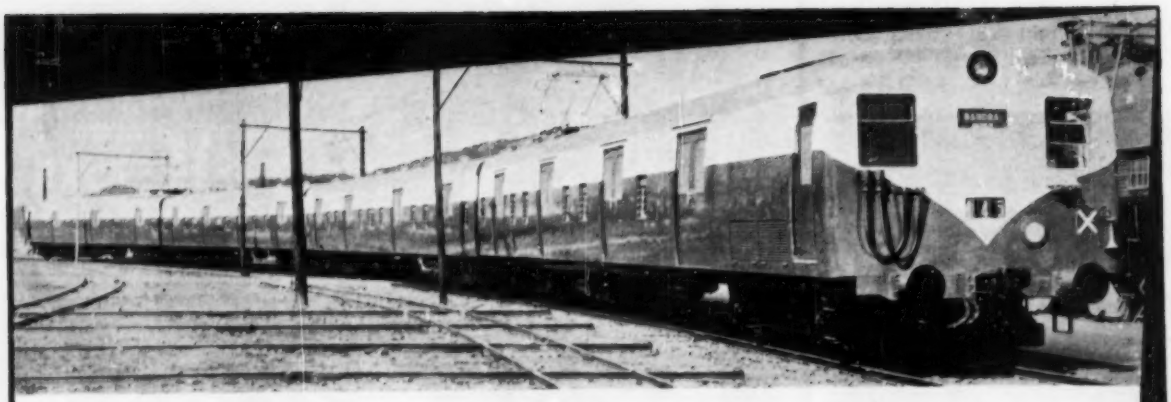


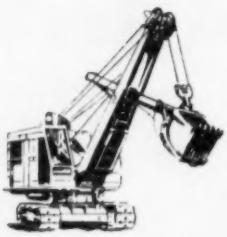
WORLD TESTED STURDY

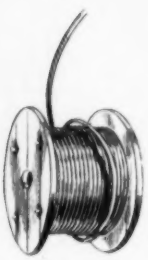
HITACHI'S

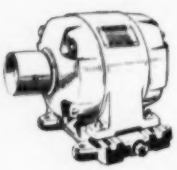
LOCOMOTIVES

and

CARS

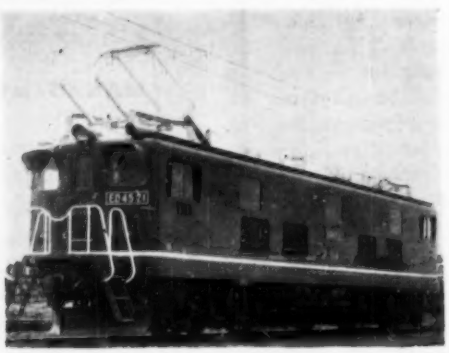






ELECTRIC (A.C. & D.C.) LOCOMOTIVES
DIESEL-ELECTRIC (DEL) LOCOMOTIVES
STEAM LOCOMOTIVES
BATTERY LOCOMOTIVES
ELECTRIC CARS

FREIGHT CARS	PASSENGER CARS
GASOLINE CARS	TANK CARS
TROLLEY BUSES	DIESEL CARS



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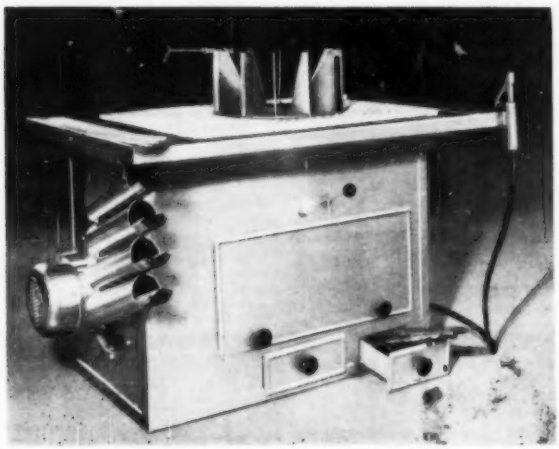
Plywood Dome

All skin, no bones might be a fitting description of a new 12,000 square foot building which has just been demonstrated in America. The structure, which is demountable and portable, consists of ¼-inch plywood sheets and 2 × 2 inch wood strips bolted together to form a hemispherical dome 39 feet in diameter. Holes in the plywood are predrilled in patterns so that the sheets assume the desired spherical shape. The materials used for the structure shown left (to be used in Korea as a temporary church) weighed 3,500 pounds and fitted easily into a small truck. **Plydomes, Inc., Des Moines, Iowa, U. S. A.**

Midget Voice Recorder

The field engineer in the left-hand picture is talking into a voice recorder scarcely larger than a camera. Back in the office (right) he can play back his oral notes for transcription. The unit, which weighs only 2 pounds 11 ounces, is designed for business men, newspapermen, and others who have to make notes when they are not within earshot of a secretary.

The battery-powered unit uses magnetic tape, which records for an hour and can be erased. A finished tape can be mailed to the office and, if it is to be transcribed by a secretary, can be inserted in a Dictet Typer which amplifies and slows down the voice. **Dictaphone Corp., 711 3rd Ave., New York, New York, U. S. A.**



Extracts Welding Fumes

Welding fumes are exhausted in a novel way in this welding bench. Main features of the bench are:

—Fume extraction through suction hoods. For inspection purposes the exhauster may be reached through removable doors.

—A removable grid lattice top; electrode storage trays on both sides of the bench (see picture, left); an insulated container for welding tongs, which are insulated from the bench top by rubber sleeves.

—The bench can be adjusted to take unwieldy work pieces.

Overall dimensions of the bench, which can be supplied as a transportable unit, are: height and depth 2 feet 7½ inches, length 3 feet 7½ inches. **Robert Hildebrand Maschinenbau GmbH, Oberboihingen, Wuerttemberg, Germany.**

For Safer Miter Cutting

A saw guard for miter cuts has been designed to protect the worker without slowing down his work.

The guard, shown here at use on tilting arbor saws in a frame-cutting room, is attached to the miter gage. The saws are arranged in pairs with one worker making the first miter cut from a 10-foot molding strip and the second operator cutting the other miter. The guard on the saw making the first cut consists of a piece of wood and a transparent plastic sheet which extends over the saw blade except during the actual cutting. The second guard has a wooden block attached to both sides of the plastic, one of which pushes the short waste piece out of the way on the return stroke. **Rockwell Mfg. Co., 400 North Lexington Ave., Pittsburgh 8, Pennsylvania, U. S. A.**

Aluminum Bulk/Transporter

A new all-aluminum truck body has been designed for low-cost bulk transport of complete or divided loads. A twin-run hydraulic tipping gear, fitted with a stabilizing device and operated by a combined power take-off and pump unit, is claimed to give fast tipping free from body sway. An automatic hydraulic sack-lifter is fitted for rapid loading. The complete transporter can be supplied for any 4, 6 or 8-wheel chassis. **R. Murfitt, Ltd., Wisbech, Cambridge, England.**

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The very capacitive dustbag can easily be taken out vertically.
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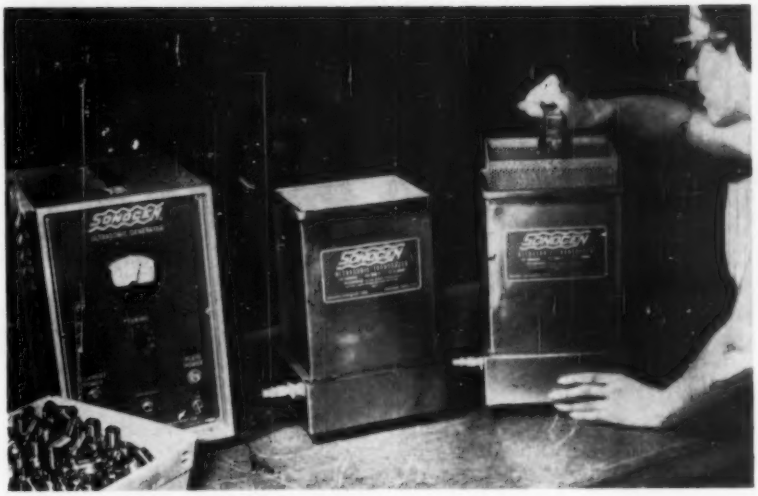
easily with this new piping, made of polyvinyl chloride "Koroseal". It can be assembled or taken apart in seconds. The coupling, which is said to take up to 10-degree misalignment in pipe joints, is very light and designed to resist high pressure and corrosion. **B. F. Goodrich Company, Akron, Ohio, U. S. A.**

Tiniest Transistor?

What is claimed to be the world's smallest transistor—3.9 millimeters long by 2.9 millimeters in diameter—has just been produced in Switzerland. The manufacturer expects that the transistor's reduced dimensions will make it of special value in applications such as hearing-aids, "transistorized" wristwatches, etc. The average current amplification factor is 70 in the grounded emitter circuit, with a collector-emitter voltage of 2 volts and an emitter current of 0.5 milliampere. **Philips A. G., Binzstrasse, Zurich, Switzerland.**



Ultrasonic Cleaning System

A 125-watt generator (left) and a stainless steel tank-transducer combination can be used together for cleaning small parts which have to be dirt-free before assembly. This is how the cleaning is done: The generator (called the "Sonogen") sends highfrequency pressure waves through a solution, causing the dirt to be literally blasted off all surfaces in contact with the liquid.

The generator is fitted with a switch for directing energy to either of the transducers, the first of which is normally used for cleaning and the second for ultrasonic rinsing. Because the tanks

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are of stainless steel, detergents and some acids may be used without harming the transducer. **Branson Ultrasonic Corp., 40 Brown House Road, Stamford, Connecticut, U. S. A.**

Controlled Braking for Lift Trucks

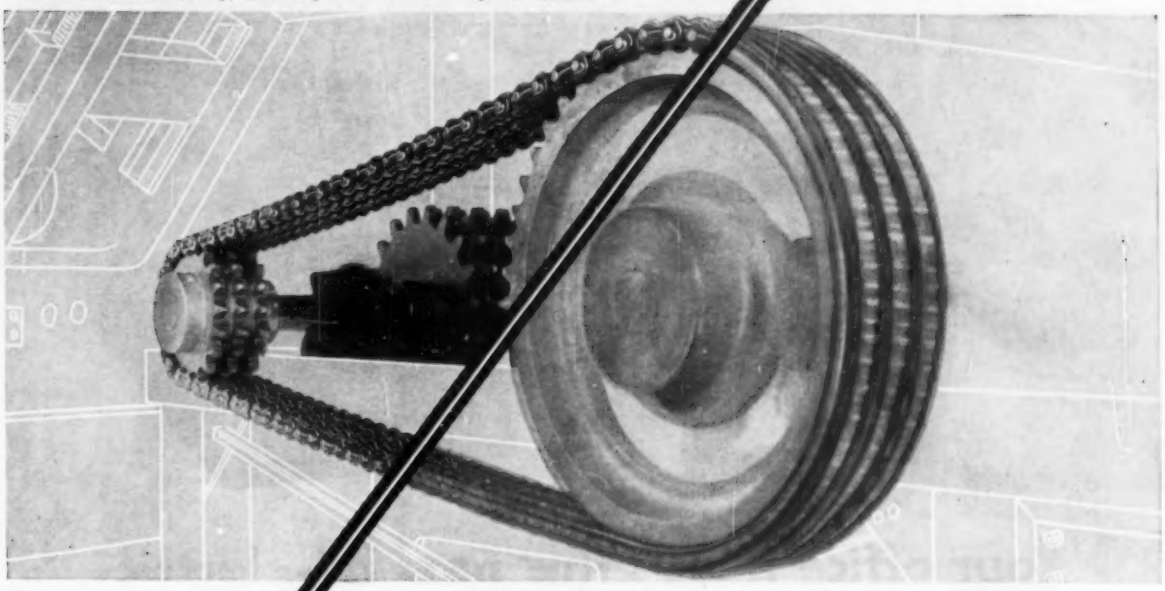
A new control system, said to be the first to combine "dynamic braking" and "controlled plugging", is now standard with this company's electric lift trucks. With controlled plugging, the truck can stop and then pick up speed in the opposite direction when the control grip is reversed. The braking device, which applies when the truck is traveling in either forward or reverse, allows it to come to a gradual stop when the control handle is released. **Lewis-Shepard Products, Inc., 125 Walnut Street, Watertown 72, Massachusetts, U. S. A.**

Latest Entrant in Fast Computer Race

A new large-scale electronic digital computer, with a miniaturized memory that increases range and speed of problem solutions, is claimed to put Britain among the leaders in the manufacture of electronic computers. Built for large-scale research work, the "Mercury", as it is called, is now being used in guided missile control, atomic research, nuclear engineering and aircraft design. Cost of the computer is about

Not just static strength, but . . .

RESISTANCE TO TENSILE STRESS is achieved by use of properly heat-treated, accurately-machined side bars made of premium steel and fitted with properly-hardened pins, bushings and rollers. But to resist *operational* stresses, additional controls over dimensional accuracy, uniformity and roller resiliency are essential.



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In addition to known tensile loads, roller chain in motion is frequently subject to other operating stresses. Engagement with sprockets . . . shock of starting loads . . . centrifugal loads—there are many similar stresses.

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LINK-BELT COMPANY: Engineers • Manufacturers • Exporters of Machinery for Handling Materials and Transmitting Power • Established 1875. **EXPORT DIVISION:** Dept. MD-11, 2680 Woolworth Bldg., New York 7, U.S.A., Cable Address: Linkbelt—New York • Representatives throughout the World.

14,107-E

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Your office needs this new all-electric 4-second copying machine

In a large office, the "Secretary" Brand Copying Machine is an invaluable aid to the stenographic department . . . in a small office, it may *be* the stenographic department. This amazing desk-top copying machine makes perfect copies in just four seconds. It requires no chemicals, liquids or acids—pays for itself in time saved making accurate, dry copies. Find out how the "Secretary" and "Thermo-Fax" Brand Copying Paper can save time and cut costs in your office. For full information or for the name of your nearest supplier write Minnesota Mining and Manufacturing Co., International Division, 900 Bush Avenue, St. Paul 6, Minnesota, U.S.A.

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WORLDWIDE
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PROFESSIONAL MEN, like lawyers, doctors, ministers, get quick clean copies of letters, contracts, legal documents, ledger pages and other business forms with the "Secretary".

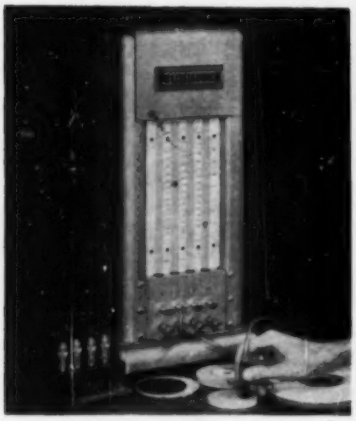
EXECUTIVES use the "Secretary" when they need fast, accurate copies of meeting notes, work sheets, financial statements, budgets, etc. Only 4 seconds from original to error-free copy!

SMALL BUSINESS firms find the "Secretary" pays for itself in copying time saved on contracts, order forms, purchasing agreements, letters, invoices, and other important business papers.

3M

Made in U.S.A. by Minnesota Mining and Mfg. Co., International Division, St. Paul 6, Minnesota. Other plants in Austria, England, France and Germany.

£100,000 including installation and maintenance. **Ferranti Ltd., Hollinwood, Lancashire, England.**



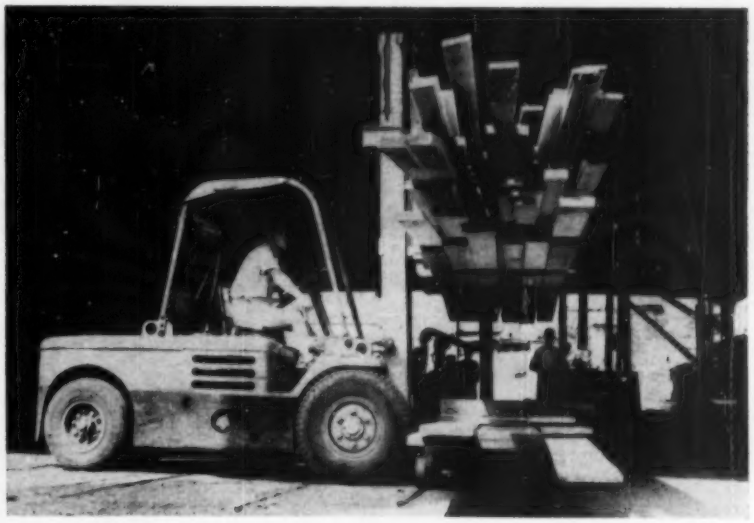
Tests Density of Grinding Wheels

This new air gage is designed to reveal uniformity of density in grinding wheels, honing sticks, and other abrasive products. This it does by measuring the rate of air-flow into the wheel. Each air column in the gage covers a specific range. The operator tests the wheel at several places with the pneumatic gage head and notes float fluctuation. Hard spots in the wheel are shown by low float positions and soft spots by higher positions. **Sheffield Corp., Dayton 1, Ohio, U.S.A.**

Fire Extinguisher Acts Like Gun

This portable, dry chemical fire extinguisher has been designed

ONE LIFT TRUCK ELIMINATES NEED FOR 10 MILL TRUCKS, 4 DELIVERY TRUCKS



Loading and unloading time saved with one Hyster Lift Truck

ANNANDALE, N. S. W., AUSTRALIA—The excellent maneuverability of the 8,000-lb. capacity Hyster lift truck purchased by Rozelle Timber Pty., Ltd., made it possible to feed all their mill machinery and carry timber in and out of the mill with the truck. These chores previously required man-handling timbers on ten mill trucks, a slow, costly procedure.

Truck loading was also so accelerated that four delivery trucks were no longer needed and were subsequently sold, another tremendous saving.

You can eliminate wasteful operations on your job, too, with a Hyster Lift Truck. You can choose from a complete line of pneumatic or cushion tire trucks. Call your Hyster dealer for details.

For additional information write to

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EXPORT DEPARTMENT

1800 N. Adams Street, Peoria 1, Illinois

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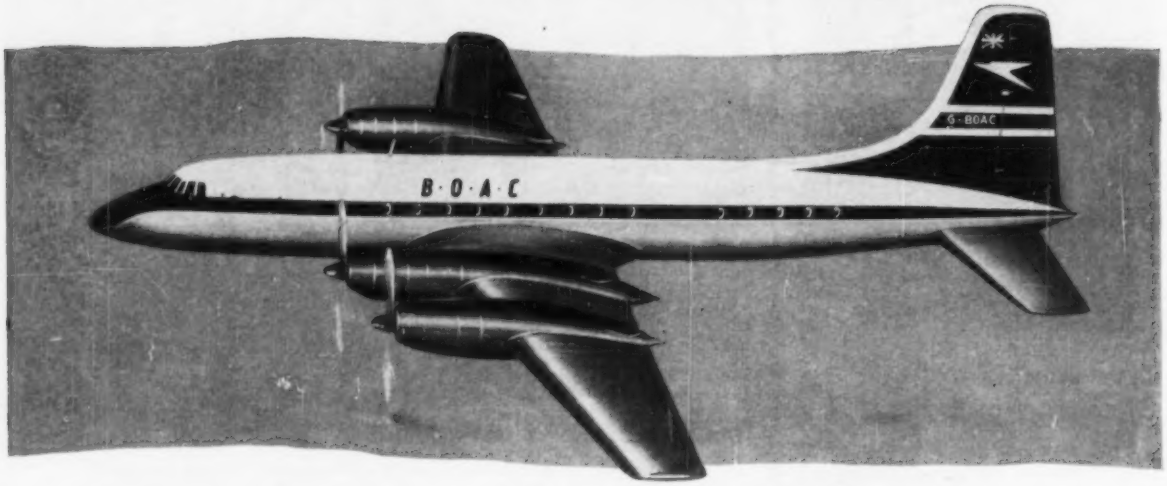
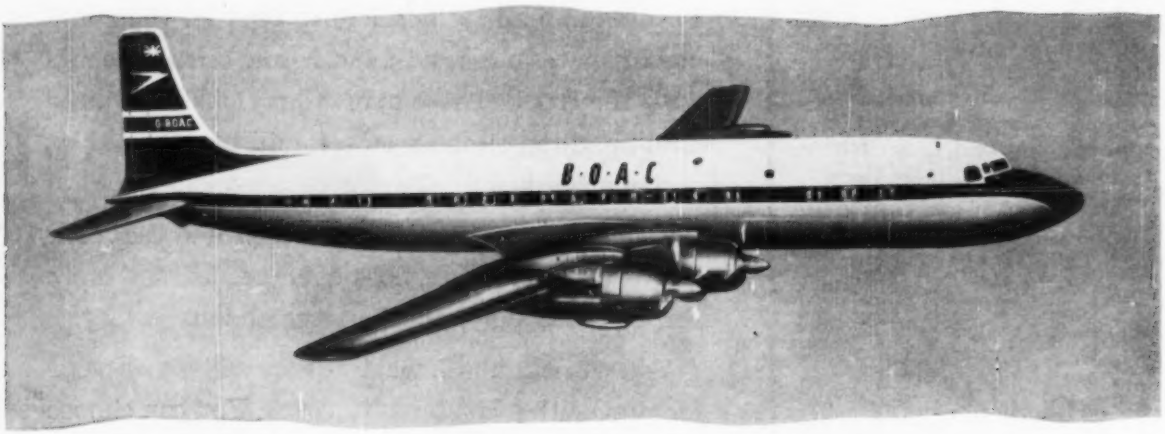


Britannia AND DC-7C



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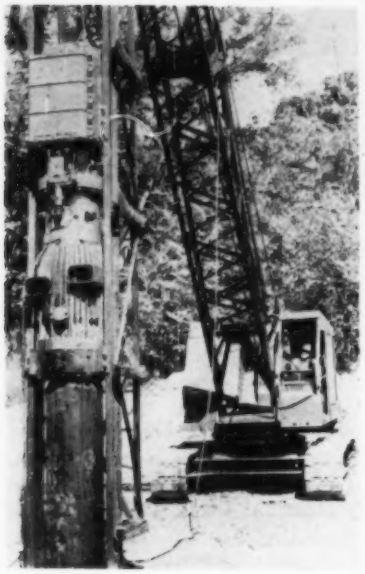
for particularly simple operation: It is worked by aiming the discharge at the fire and pulling the trigger. The unit is available in 20 and 30-pound capacities.

Other features include:
—center balancing for easy carrying,
—pressure gages recessed in the handle,
—baffle nozzles to reduce discharge velocity without reducing range. **Walter Kidde & Co., Inc., Belleville, New Jersey, U. S. A.**



Combination Crane and Pile Hammer

A crane now can be converted to a pile hammer by the addition of a single cable that hoists the hammer up guide rails. No auxiliary equipment is needed. As the hammer makes its downstroke, a fuel pump injects atomized fuel under high pressure into the space between the falling ram and the anvil resting on the pile. An explosion from the force of the downstroke drives the ram upwards again. The new unit strikes more blows than a conventional hammer. The hammer comes in three models, with prices ranging from $8,250 to $16,500. The largest hammer weighs 12,500 lb and has a striking force of 30,000 ft-lb. **Link-Belt Speeder Corp., 1201 Sixth St., S. W., Cedar Rapids, Iowa, U. S. A.**

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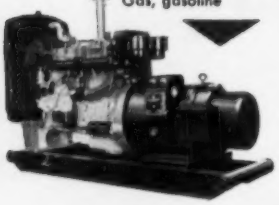

A superb line of Enginators— backed by over 50 years' experience in building heavy-duty engines and electrical equipment. For reliable performance on all fuels, these accurately balanced Waukesha engine-generator combination units supply smooth, steady power in continuous, intermittent and standby service.

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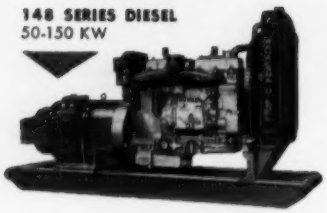
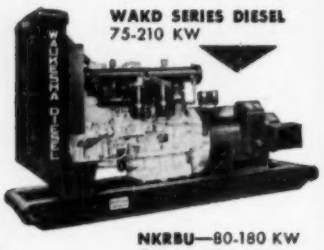
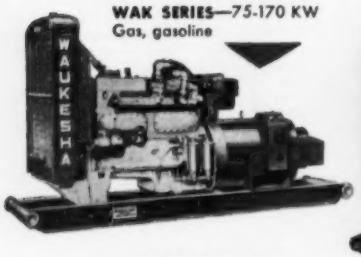


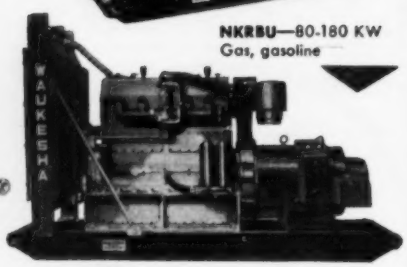
WAKD SERIES DIESEL
75-210 KW



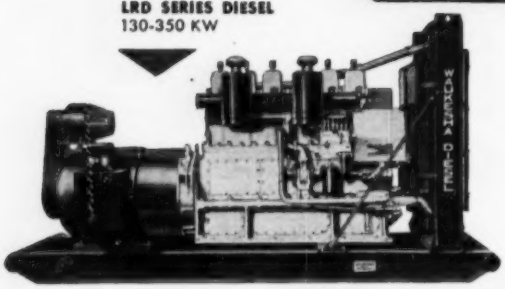
WAK SERIES—75-170 KW
Gas, gasoline



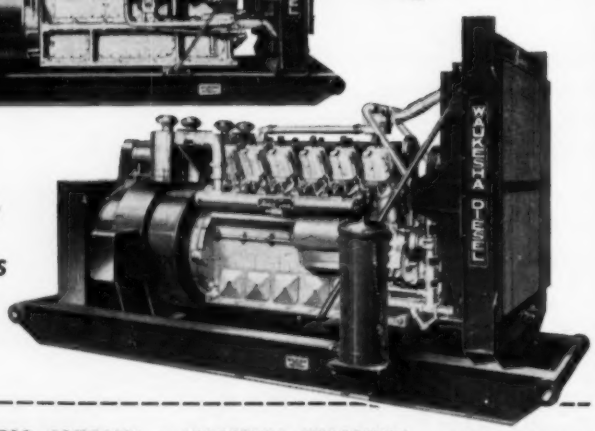
NKRBU—80-180 KW
Gas, gasoline



LRD SERIES DIESEL
130-350 KW



VLR SERIES—250-730 KW
LPG, natural gas, Diesel



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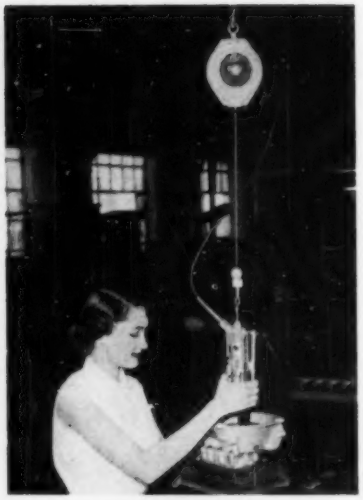
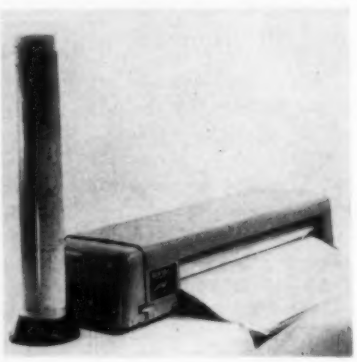
333

WAUKESHA MOTOR COMPANY • WAUKESHA, WISCONSIN *RAILWAY DIVISION*



For Handling Portable Tools

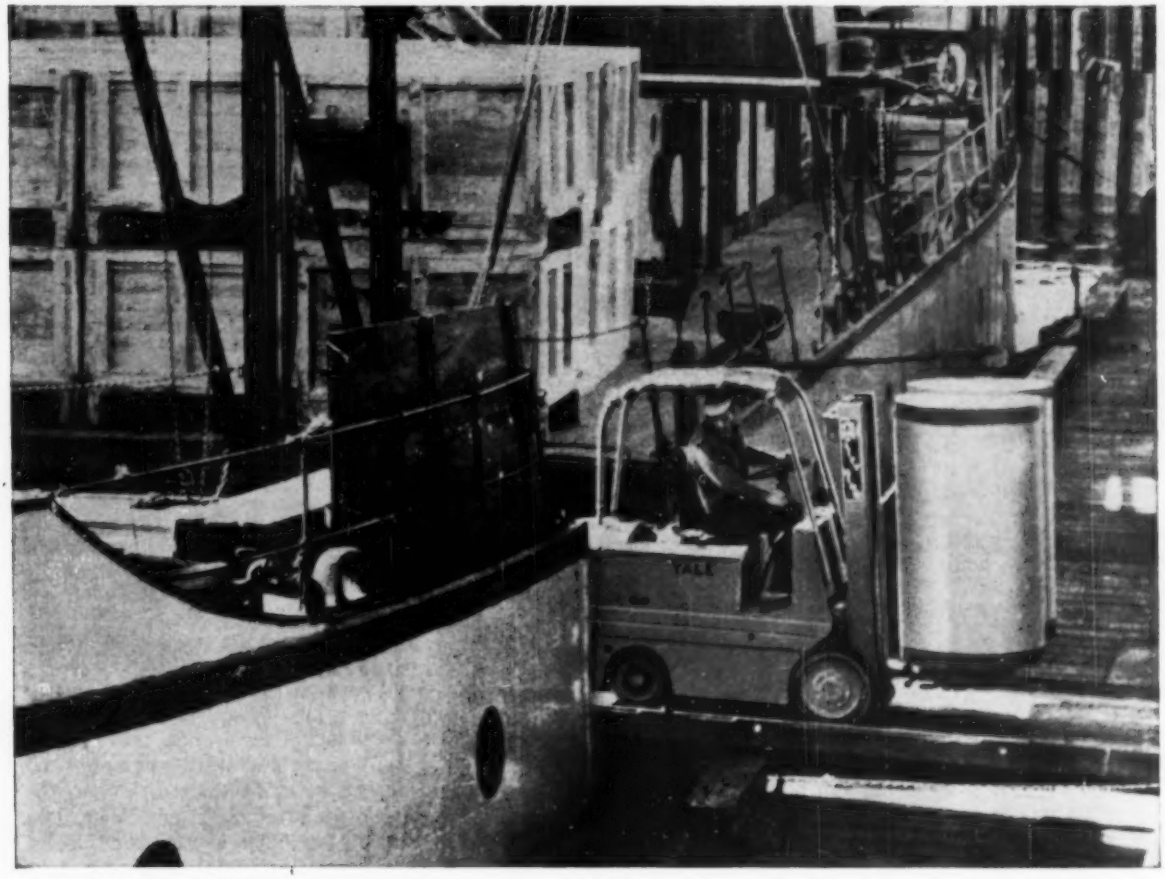
An automatic safety brake is included in a new suspension balancer intended for handling air and electric tools, inspection gages, and welding and other equipment up to 10 pounds in weight. The unit also has a full-swivel upper hook with an auxiliary suspension provision. The balancers, which have a 6-foot travel range, are externally adjustable for cable tension and travel. **Thor Power Tool Company, Prudential Plaza, Chicago 1, Illinois, U. S. A.**



Diazo Rotary Printer

The Blu-Ray rotary reproducer makes white prints from translucent originals at a rate of four feet per minute. The printer, available in capacities 42 and 22 inches, uses diazo paper of any standard manufacture. It comes complete

FOR THE WORLD'S WORK: YALE lift trucks



YALE TRUCKS MOVE MORE CARGO IN LESS TIME, CUT YOUR HANDLING COSTS IN HALF

Wherever materials are shipped, manufactured or stored, they must be moved quickly and smoothly for maximum efficiency. That's why industry the world over chooses Yale trucks.

Yale trucks handle all types of loads easily and safely... maintain a steady flow of materials in factories... speed shipments on loading docks... stack loads higher for maximum use of available storage space. These benefits mean greater production... better use of manpower... savings in time and space ... reductions in handling costs up to 50%!

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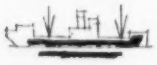
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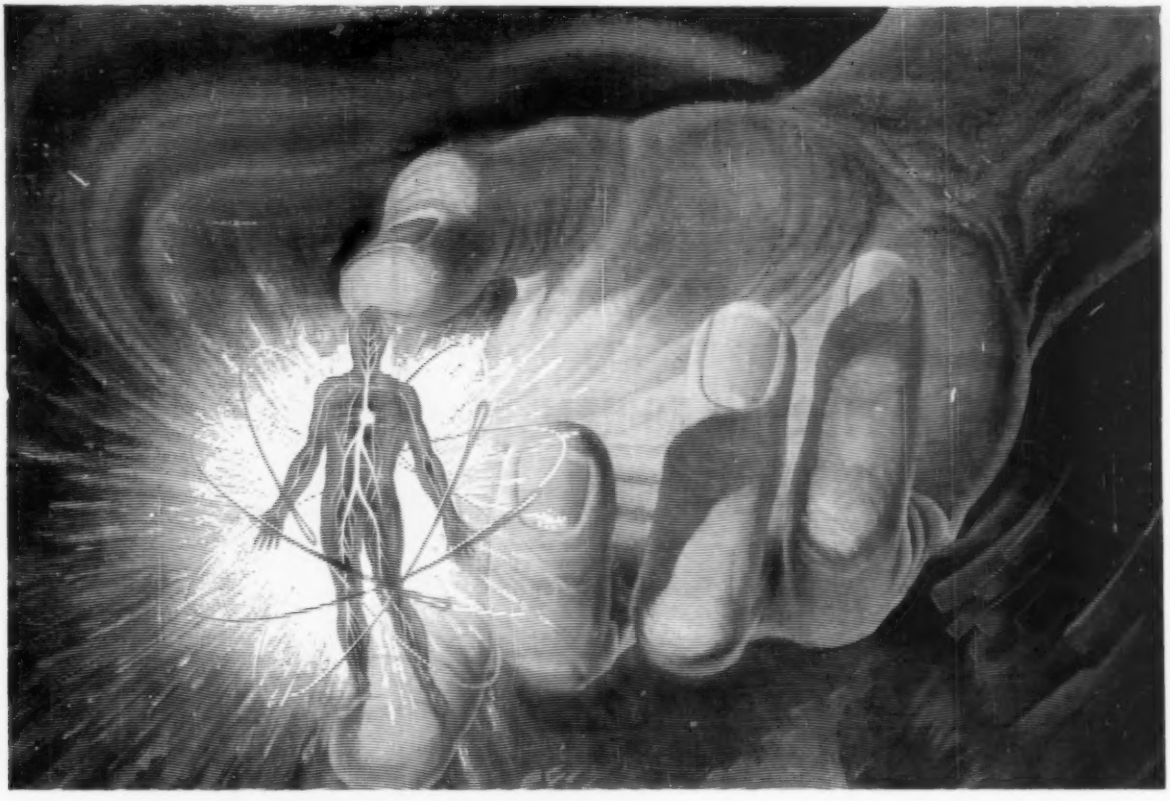
with a dry developing unit, which features a transparent tube for visual observation of the print development. With the addition of a filter, silver transfer-type photocopy papers can be exposed and then developed in an accessory processor. **Peerless Colonial Products, Inc., 200 N. Main St., Ivoryton, Connecticut, U. S. A.**

Vertical-Lift Truck

A new high-fork lift truck, the "Elbolift," will lift 10 feet without a mast—a development which, the manufacturer claims, has "lifted" thousands of pounds from the overall weight and gained greater visibility for the driver. Load stability is provided by a built-in load retraction device, while tiering is facilitated by a tilt of 10 degrees back and 5 degrees forward. Capacities of the trucks, which are electric-driven, are from 12,000 to 20,000 pounds. **Automatic Transportation Company, 149 West 87th Street, Chicago 20, Illinois, U. S. A.**

Versatile Spray Gun

Spraying of angular joints in buildings and tunnels is made easier by a new version of a German pneumatic gun. The gun applies all conventional coatings to walls and ceilings. The new version has seven rather than four air nozzles, and nozzle plates have more discharge perforations. The apertures of the nozzle plates are adjustable, to accommodate the specific coating being used. **Rudolf Eichenauer A. G., Allerheiligen Strasse 77, Frankfurt Main, Germany.**



Your health will be better since doctors can now use

the voice of the atom

DOCTORS have long wanted to learn more about the human bloodstream – how it supplies nourishment . . . defends against disease . . . becomes diseased, itself.

THAT WISH IS REALITY today, because atomic energy has given a voice to certain of nature's elements. When these elements are exposed to the powerful radiation of splitting atoms, they become radioactive, themselves, and are called *radioisotopes*. The radiation they give off can be detected and heard with special instruments.

Now doctors introduce isotopes of iodine, iron, sodium, or other elements into the bloodstream. Their course can then be followed to determine the location and nature of the trouble. Isotopes are also becoming increasingly important in actually treating ailments.

ISOTOPES are being used in similar fashion by industry and agriculture to analyze materials, measure wear, control processes, and to help answer mysteries of how plants absorb nourishment from the soil and how it affects their growth and health.

THE PEOPLE OF UNION CARBIDE operate, under a United States Government contract, the Oak Ridge National Laboratory, the United States' chief source of radioisotopes, as well as the huge atomic materials plants at Oak Ridge, Tennessee and Paducah, Kentucky, U.S.A.

FREE: *To learn more about the atom and the tremendous strides made in the peaceful applications of atomic energy, write for the illustrated booklet "The Atom In Our Hands." Please ask for booklet IMD-11.*

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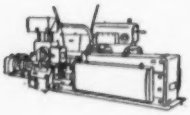
Where Performance Counts

WALLACE & TIERNAN EQUIPMENT IS USED

CHLORINATION

The W&T high capacity chlorinator shown above at a steam generating plant is used for chlorination of cooling water to eliminate slime formation on condenser water-side surfaces. The W&T chlorinator was chosen because of its accuracy, dependability, and simplicity of operation. These qualities are typical of Wallace & Tiernan's complete line of chlorination equipment which is widely used both in industry and in the protection of public water supplies.



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Equipment includes chemical solution feeders, gravimetric and volumetric dry feeders, and gravimetric meters for use in the chemical, grain, and food processing industries.

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Includes a number of protective devices for navigation such as buoys, lamp changers, flasher mechanisms, signal timers, fog horns, aircraft flasher units and other related apparatus designed for use in the marine and air transportation field.

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Equipment includes a complete line of aneroid and mercurial pressure sensitive instruments, such as altimeters, barometers, and manometers designed for use in industrial testing as well as for research purposes.

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NEW PRODUCT BRIEFS

Liquid Level Sensor—A lightweight, liquid level point sensor for aircraft, missile fuel and oxidizer systems operates on ultrasonic principles to detect the presence or absence of liquid at a predetermined level. The sensor is said to be free from spark or radiation hazard and to operate over a wide range of ambient temperatures—from −200°C to +125°C. **Acoustics Associates, Glenwood Landing, New York, U.S.A.**

Small Pump—A multitude of uses, such as draining flooded floors, washing cars, transferring liquids, are claimed for a small-sized new pump. It is driven by electricity, self-priming, and weighs 25 pounds. **Simens-Schuckertwerke A.G., Sieboldstr. 5, Erlangen, Germany.**

Industrial Stethoscope—A new non-electric, airsonic industrial stethoscope is designed for checking leaks in hydraulic systems and testing soundness of castings and welded joints. The instrument is a self-contained unit independent of any outside power source. **Industrial Airsonic Co., Brussels, Belgium.**

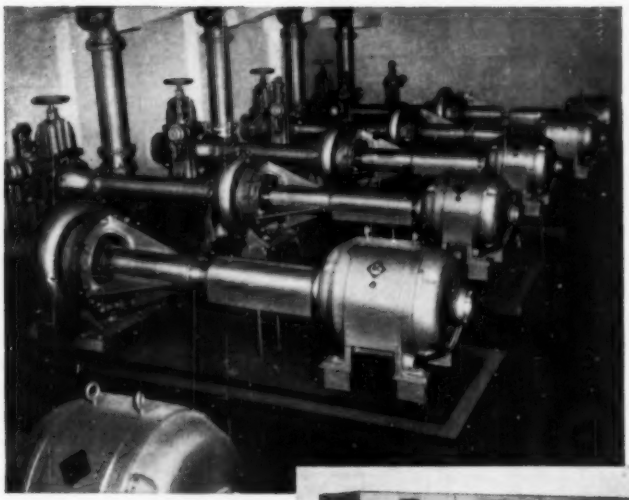
Speed Recorder—The makers of a new recorder claim that it records speed with an accuracy of plus or minus 0.1 per cent of measured speed. The instrument has been designed for use with direct-current tachometer generators and can be calibrated in feet per minute, or other units, to meet requirements in steel, textile and other industries. **International General Electric Co., 150 East 42nd St., New York, New York, U.S.A.**

For Defect-Free Yarn—A new electronic device catches defects (slubs) in yarn when it is being wound on to a spindle, thus reducing cutting losses in ready-made clothing. **N.V. Qualitex, Enschede, Holland.**

In Rio de Janeiro...

Saturnino de Brito Station

Every modern sewage pumping station is equipped with Allis-Chalmers Pumps, Motors and Control

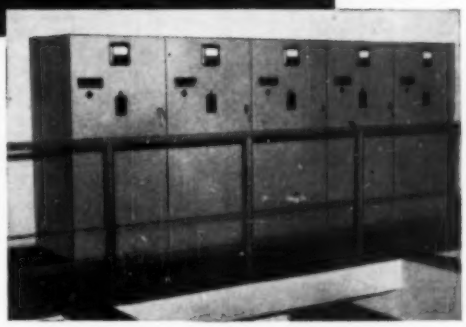


These 6 Allis-Chalmers motor-pump combinations are installed at Saturnino de Brito Station which was designed and built by Dr. Enaldo Cravo Peixoto, Director of the Sanitary Sewage Department, and Yamagata Engenharia S. A., General Contractors.

Rio de Janeiro, with over 3 million people in a narrow strip of land between mountains and sea, requires the largest number of sewage pumping stations of any city in the world. All the main stations in Rio are equipped with Allis-Chalmers pumps, motors and control.

This is an example of how Allis-Chalmers can combine machinery with broad engineering experience to help fast-growing cities everywhere solve public service problems.

In the same way, Allis-Chalmers offers machinery and engineering aid to all of the world's major industries: electric power, mining, cement making, manufacturing. For help with your equipment problems, big or little, in any industry, contact the distributor in your country, or write Allis-Chalmers International, Milwaukee 1, Wisconsin, U.S.A.



Allis-Chalmers motor control for the Saturnino de Brito Station. Inaugurated in 1956, this station is one of the newest sewage pumping stations in the extensive chain of pumping stations serving Rio and surrounding areas. All of these modern installations are equipped with Allis-Chalmers pumps, motors and control.

A-5282

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A Division of Allis-Chalmers Manufacturing Company

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Products of the Allis-Chalmers Industrial Equipment, Power and General Products Divisions are distributed by firms in these cities. Distributors of Tractor Group products also are located in principal cities.

ALASKA—Fairbanks.
ARGENTINA—Buenos Aires.
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BELGIUM—Brussels.
BOLIVIA—La Paz.
BRAZIL—Rio de Janeiro, São Paulo, Recife (Pernambuco), Porto Alegre.
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BURMA—Rangoon.
CANADA—Montreal, St. Thomas
CHILE—Santiago.
COLOMBIA—Barranquilla, Bogotá, Medellín, Cali.
COSTA RICA—San José.
CUBA—Havana.
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FINLAND—Helsinki.
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GUATEMALA—Guatemala City.
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IRAQ—Baghdad.
ISRAEL—Tel-Aviv.
ITALY—Milan.
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JAPAN—Osaka, Tokyo.
KENYA—Nairobi.
MALAYA—Kuala Lumpur, Ipoh, Kota Bharu, Penang, Malacca, Seremban, Kuantan.
MEXICO—Guadalajara, Mexico City, Monterrey.
NETHERLANDS—Amsterdam.
NEW ZEALAND—Wellington, Auckland.
NICARAGUA—Managua.
NORWAY—Oslo
PAKISTAN—Karachi.
PANAMA—Panamá City.
PARAGUAY—Asunción.
PERU—Lima.
PORTUGAL—Lisbon.
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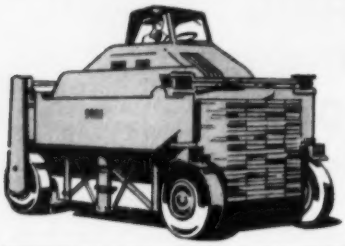
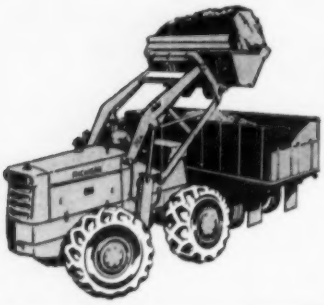
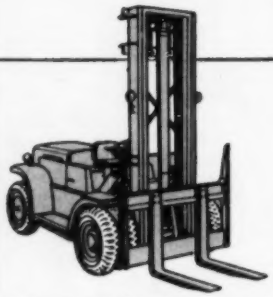


Straddle Carriers
8 models: 12,000 to 60,000 lbs

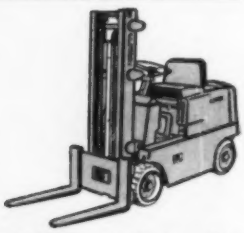
Michigan Excavator Cranes
3 models: 10, 15, 25 tons



Michigan Tractor Shovels
8 models: 16 cubic feet to 6 cubic yards

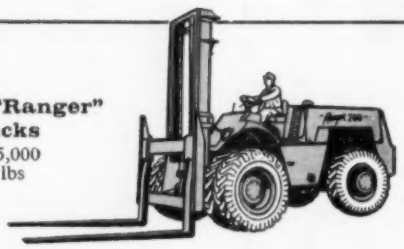


Pneumatic tire fork trucks
17 models: 2,000 to 40,000 lbs

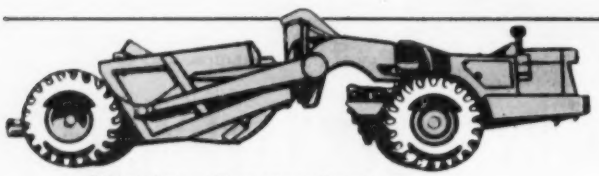


Solid tire fork trucks
29 models: 3,000 to 10,000 lb capacities. Gasoline, LPG, electric power.

Heavy-duty "Ranger" fork trucks
3 models: 15,000 to 30,000 lbs

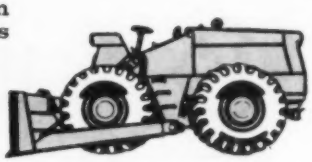


Michigan Tractor Loggers
4 models: 10,000 to 20,000 lbs



Michigan Tractor Scrapers
3 models: 10½, 18, 27 cubic yds

Michigan Tractor Dozers
3 models: 165, 240, 375 hp



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11 models: 500 to 12,000 lbs

Powrworkers
13 models: 1,500 to 10,000 lbs

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Management Digest's editorial staff here again does the "worthwhile reading" for you to save your time. For the following literature, please write on your company letterhead directly to the address given, mentioning Management Digest.

Management & the Engineer—Here are four Executive Research Reports that will provide suggestions for improving engineer-management relationships (see page 13). 1) How to Improve Engineering-Management Communications, 2) How to Improve the Utilization of Engineering Manpower, 3) How to Attract and Hold Engineering Talent, 4) How to Train Engineers in Industry. $2.00 per copy, all 4 reports $6.00. (National Society of Professional Engineers, 2029 K Street N.W., Washington 6, D. C.)

Cinema for Salesmen—Four new films (in English or Spanish) cover all phases of salesmanship, from selecting a prospect to making the sale. Other films are available, too, covering supervisory problems, industrial management, personnel and human relations. (Book Export Division, McGraw-Hill International Corp., 42nd Street, New York 36, New York.)

Paperwork Problem?—"Case Studies in Records Retention and Control" shows how a records management program can save space, time, and money in the office. $7.50. (Controllership Foundation Inc., 2 Park Avenue, New York, New York.)

R&D for Small Business—Here are two new booklets in AMA's Research and Development Series. Booklet 3 tells how the smaller company can best use its technical and managerial personnel. $1.75. . . . Practical suggestions to help the smaller company organize and carry out a successful product development program are discussed in Booklet 4. $1.75. (American Management Association, 1515 Broadway, New York 36, New York.)

Bulletins from Industry—Votator heat transfer apparatus—for the continuous processing of heat-sensitive and viscous liquids—is described in 16-page brochure. (The Girdler Company, Votator Division, Louisville 1, Kentucky) . . . Booklet A-5034 summarizes the latest information on nonwoven fabrics for industrial, home furnishing, and apparel uses. (E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Delaware) . . . Numerical Control—a fully-automatic ultra-precision means of translating blueprint data into a series of machine positions—is explained in Bulletin 609. (Pratt & Whitney Company, Charter Oak Boulevard, West Hartford 1, Connecticut) . . . "In Record Keeping, It's Visibility That Counts" describes the advantages of Diebold's visible record systems. (Diebold, Inc., 828 Mulberry Rd. S.E., Canton 2, Ohio.)

Better Mechanical Engineering—British research in the field of mechanical engineering—including strength of materials, hydraulic machinery, metalworking processes, heat transfer, and applied thermodynamics—is reviewed in the 1956 Mechanical Engineering Research Report. 67 pages, 5/6d. or 77¢. (H. M. Stationery Office, P.O. Box 569, London S.E. 1, England.)

"Materials Handling Equipment"—Here in one handy, well-organized volume is the complete story of materials-handling machines and systems, what they do and how they do it. 636 pages, $17.50. (Chilton Book Division, 56th & Chestnut Streets, Philadelphia 39, Pennsylvania.)

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Business Education World
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Coal Age
Construction Methods & Equipment
Control Engineering
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Electrical Merchandising
Electrical West
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Electrical World
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Engineering & Mining Journal
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Nucleonics
Petroleum Week
Power
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Textile World
Today's Secretary

McGraw-Hill Publishing Co., Inc., 330 W. 42nd St., New York 36, N. Y.

American Builder, Marine Engineering, Railway Age, Railway Track and Structures, Railway Locomotive and Cars, Railway Signaling & Communications
Simmons-Boardman Publishing Corp., 30 Church St., New York 17, N. Y.

American Business
Dartnell Publications, Inc., 4660 Ravenswood Ave., Chicago 40, Ill.

Architectural Record
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Banking
American Bankers Association, 12 E. 36th St., New York 16, N. Y.

Business
Business Publications Ltd., Mercury House, 109-119 Waterloo Road, London, S. E. 1

Ceramic Industry
Industrial Publications, Inc., 5 South Wabash Ave., Chicago 3, Ill.

The Controller
Controllers Institute of America, Inc., Two Park Ave., New York 16, N. Y.

The Economist
The Economist Newspaper, Ltd., 22 Ryder St., London, S. W. 1

Harvard Business Review
Harvard University, Soldiers Field, Boston 63, Mass.

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Keeney Publishing Co., 6 N. Michigan Ave., Chicago 2, Ill.

Industrial Marketing
Advertising Publications, Inc., 200 E. Illinois St., Chicago 11, Ill.

The Management Review, Personnel, Supervisory Management
American Management Association, 1515 Broadway, New York 36, N. Y.

Metal Progress
American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

Modern Packaging, Modern Plastics
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Fritz Publications, Inc., 431 S. Dearborn St., Chicago 5, Ill.

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Petroleum Press Service, 91 & 93 Bishopsgate, London, E. C. 2

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Temple Press, Ltd., Bowling Green Lane, London, E. C. 1

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Printers' Ink Publishing Co., Inc., 205 E. 42nd St., New York 17, N. Y.

The Rubber and Plastic Age
Rubber and Technical Press, Ltd., Gaywood House, Great Peter St., London, S. W. 1

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Bill Brothers Publishing Corp., 386 Fourth Ave., New York 16, N. Y.

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The Times Publishing Co., Ltd., Printing House Square, London, E. C. 4

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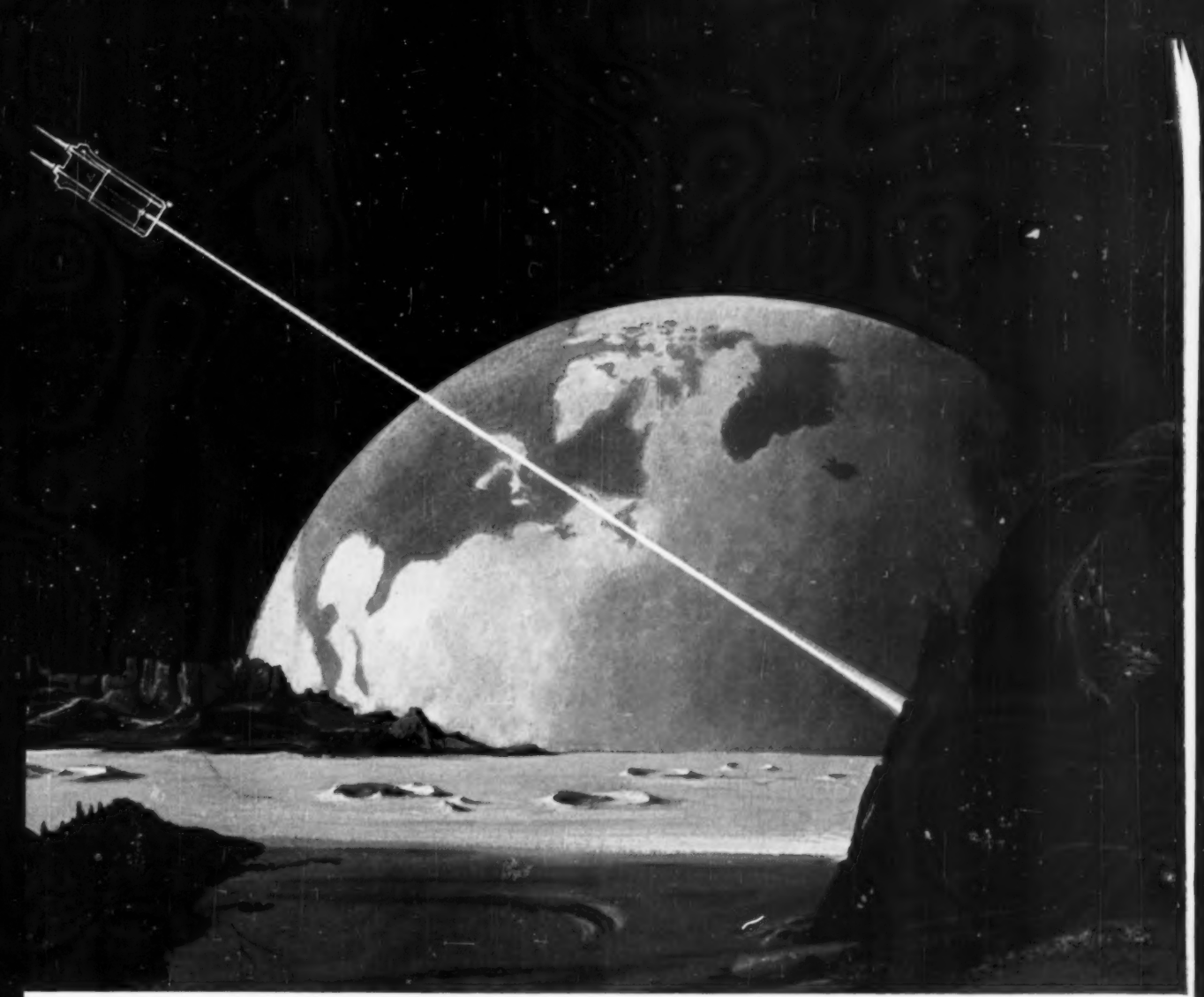

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